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July 1864

THE PRINCIPLES AND PRACTICE OF MEDICINE;

DESIGNED CHIEFLY FOR STUDENTS OF INDIAN MEDICAL COLLEGES.

BY

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PREFACE.

The following work, although designed for Students of Indian Medical Colleges, may perhaps be found in some degree useful by those Medical Officers who are for the first time entering upon medical practice in India.

It has been the Author's aim to treat each subject clearly and succinctly: to avoid as much as possible controversy and speculation: and to allot space to special diseases in proportion to their importance and prevalence in tropical countries. The preparation of a complete treatise upon the Practice of Medicine, which would claim to rival existing standard works, has not been attempted. Nor has it been sought to supersede the many excellent treatises that are extant upon the prevailing diseases of tropical climates. The Author has desired to set before Indian Medical Students, the various subjects that are usually comprised in a system of Medicine, in those points of view in which his experience as a teacher for nearly twenty years assures him they will be most readily apprehended; and whilst on the one hand he has endeavoured for the most part to restrict his work within those limits, beyond which young men in *statu pupillari* should not be expected to travel, he has been equally solicitous on the other hand to guard against superficial treatment of his subject. Upon the judgment he may have exercised in this respect, he cannot but feel that the success of his work will in some degree rest.

New views, which are opposed to long established principles, have been carefully examined, and only admitted when supported by trustworthy evidence. In describing the treatment of special diseases, the Author has confined himself to those methods which his experience or judgment has led him to believe to be the best.

With a view to economise space, diseases which are usually treated of in Surgical works have been either omitted or very briefly described.

Exception may perhaps be taken to the absence of any attempt at a scientific classification of diseases. It was not without mature deliberation that the Author determined to discard the several classifications that have been adopted by medical writers, and to abandon the attempt to substitute a classification of his own.

From amongst the many sources from which the Author has derived assistance, he desires to mention—in addition to systematic works, and special treatises on the diseases of tropical climates—Dr. Morehead's Clinical Researches on Disease in India; Indian Annals of Medicine; Transactions of the Medical and Physical Society of Calcutta and of Bombay; and Madras Quarterly Journal.

BOMBAY, *April* 1864.

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INTRODUCTION.

The study of Medicine may be shortly stated to consist in the investigation of the means whereby disease is prevented, alleviated, or cured. By disease is to be understood an altered condition of the fluid or solid constituents of the body, in consequence of which the whole of its functions, or some one or more of them, are deranged. It must, however, be borne in mind that, within certain limits, the function of an organ may be increased or diminished, without the confines of health being passed; nor should it be forgotten, on the other hand, that considerable alteration of the structure of an organ is compatible with the apparently healthy performance of its function. In forming an idea of disease, we must, therefore, keep in view such derangement of function as is subversive of health and comfort, and such alteration of structure as is calculated, if it should not be removed, ultimately to produce it.

Viewed in this way, diseased conditions are not always to be regarded as something superadded to the system—as entities, so to speak,—but rather as the performance of the natural functions under circumstances which are foreign or abnormal. For example, the violent muscular contractions which occur in an attack of Epilepsy, due to the presence of worms in the intestinal canal, are but the normal or natural actions of muscular tissue, under the influence of an excessive stimulus. So, likewise, the heat of skin and the profuse sweating that are present during a paroxysm of ague, merely represent the healthy re-action of the system, which is the necessary result of the presence of a poison in the blood. It is plain therefore that, in many diseased states, it would be in the highest degree irrational to attempt to put a stop to those actions which, under the circumstances of their occurrence, are the healthy and necessary manifestations of the vital properties with which the tissues and organs are endowed.

The extent to which derangement of function depends upon actual alteration of the structure of an organ, is subject to much variety. Sometimes, the textures are so modified, as to be physically unfit for the performance of their office, as happens, for example, when the pulmonary air cells are filled with, or the valves of the heart thickened by, abnormal deposits. In other instances, we seek in vain for any evidence of structural change, or at all events, of any change which, on physical principles, would be sufficient to account for the derangement of function that has occurred. This want of concordance between physiological and anatomical deviations from the normal standard, has led to the arrangement of diseases in two classes, viz. functional and organic. It has, however, been doubted, whether derangement of function *can* occur, the integrity of an organ being unimpaired; and, indeed, the possibility must be admitted, of the existence of structural changes which are two subtle to be detected by our present means of investigation. Conversely, however, it is a reasonable assumption, that altered states of the vital stimuli, *i. e.* air, light, food, &c., may produce a functional or dynamic derangement, without necessarily causing structural or anatomical unfitness. But whether we admit or deny the existence of purely functional disorders, there is no doubt of the fact, that long-continued derangement of function is usually associated with organic disease. All, perhaps, that in the present state of our knowledge can be affirmed in regard to this point is, that diseases do occur which cannot be *proved* to be dependent upon anatomical changes.

Now, it may be observed, that we can scarcely advance a a single step in the study of disease, without becoming aware of the following important fact, viz. that in all persons, more or less, there is a power of resisting, to a certain extent, the causes of disease, and a tendency, when it has occurred, towards recovery. This inherent conservative property of animal textures has been recognised from an early period in the history of Medicine. It has received various names—"Vis Medicatrix Naturæ," "Anima," "Archeus," &c., as if it were something distinct or separate from the organism, and which exercises a protective influence over the working of its machinery. But in truth it is merely a part of that endowment of the original germ, in virtue of which matter is assimilated, new cells formed, and so arranged and modified, as ultimately to give rise to textures and organs. General as this property is in connection with the animal organization, it varies in a remarkable degree in different individuals. Thus, we meet with persons who from infancy are liable to every kind of ailment, and in whom, should they be attacked with a severe malady, the tendency towards recovery is but slightly marked. Others again appear to resist the causes of most diseases, and when from their intensity the resistance is overcome, the progress of the disease is usually towards a favorable termination. It is of the highest importance in the practice of Medicine to distinguish these two classes; for a mode of treatment which in the one class would be requisite to assist nature in her efforts to bring about a restoration to health, would, in the other, not unfrequently be a meddlesome and mischievous interference with her operations.

We become aware of the existence of disease in the interior of the body, in part by the patient's own description of his feelings and sensations, but chiefly by a careful examination of any derangement of function that may be present. In some instances we can submit the diseased organ to a physical examination, so as to detect any change that may have occurred in its size, consistency, or the like; whilst in other cases we become cognizant of physical changes through the medium of percussion and auscultation.

The phenomena which denote the presence of disease, are in common language known as the symptoms of it; but for the sake of technical precision, it is usual to consider them as divisible into the signs and symptoms. By the former, we understand those phenomena of which we become immediately aware by our own senses; by the latter, those that are made known to us through the patient's sensations. Thus, swelling is a sign of disease; pain a symptom of it. Although it is well to bear in mind the sense in which these expressions are sometimes used, the utility of the distinction is not very apparent.

The connection between the signs and symptoms of disease, and changes in the structure of particular organs, is proved by an examination after death. Such examination is the study of Morbid Anatomy, which, with the study of the phenomena during life, constitutes the science of Pathology.

The science of Pathology, therefore, has for its object the study of those changes, both functional and organic, which constitute disease. But it is not restricted to this—it also embraces an inquiry into the causes of these changes (Etiology), and the means by which they may be prevented & cured (Hygienics). The causes of disease are sometimes easily ascertained; in many instances they are very obscure, and not unfrequently they cannot be discovered. It is, however, very important that they should be in all cases carefully sought for: partly, because it may happen that their removal is equivalent to the cure of the disease, but chiefly because, being known, their operation upon other persons may perhaps be guarded against. This subject will be considered in some detail in a future chapter. It will be sufficient in this place, briefly to consider one circumstance, which is more or less generally operative in influencing or producing disease, viz. temperature. That the diseases of temperate and tropical countries are widely different, has long been the subject of remark. The older writers considered them so diverse, as to require to be treated upon different principles. More extended experience has however shown, that the distinction is not so much founded upon an essential dissimilarity, as upon the relative frequency and severity of particular diseases. For example, an acute abscess of the liver is the same in a tropical as in a temperate climate, and requires to be treated upon precisely the same principles; but for one acute abscess of the liver in a temperate climate, one hundred will probably be met with in a tropical country. Further, it not unfrequently happens, that the same disease varies greatly in intensity according as it occurs in the temperate or torrid zones. Thus, dysentery in the Northern parts of Europe is comparatively a mild affection; in India it is often fatal. It is not of course to be maintained that these differences are alone due to the action of heat upon the animal frame. It is probable, and indeed certain that, in producing or modifying many diseases, the effect of a high temperature is in the first instance to give rise to a poison which becomes the real factor in the causation of disease. Of this, a better example cannot be adduced, than the production and action of malaria. Nevertheless, long-continued exposure to a high temperature, renders the system predisposed to attacks of many diseases, and incapable, when they occur, of that healthy re-action which is requisite for their removal.

It may be observed, that the general effect of long-continued residence in a hot country, is to lower the tone of the system, and thus to cause debility or cachexia—a state in which the resisting powers (vis medicatrix naturæ) being lessened, there is a predisposition to, or susceptibility of, the action of the ordinary exciting causes of disease. When under such circumstances disease occurs, it is "characterized by obscurity of symptoms and slowness of progress, in proportion to the degree of asthenia or cachexia."*

But this is not the only way in which an elevated temperature may be prejudicial; it may have a direct action in actually exciting disease. When thus operative, it usually is so upon persons newly arrived in a tropical country, and under such circumstances the symptoms are well marked, the disease is rapid in its progress, and requires to be controlled by vigorous and active treatment. It is chiefly among the latter class of persons that, until within the last few years, writers upon the diseases of tropical countries have had opportunities of investigating them; and a line of treatment has in consequence been inculcated which is but partially applicable to European residents, and altogether inapplicable to the Natives of the country. It has been stated almost as an axiom, that acute diseases in tropical countries require treatment so vigorous, that it would seldom be borne by the inhabitants of temperate regions. If it be conceded (and no one will probably dispute it) that the effect of heat is to diminish the tonicity of the muscular fibre; and if, moreover, it be admitted that there is in tropical countries an agent—malaria—more or less generally operative, the action of which is similar, it is self-evident that disease must for the most part occur amongst persons who are not fit subjects for vigorous antiphlogistic treatment. Excluding therefore the class of persons newly arrived, it would appear that diseases within the tropics are to be met by treatment less lowering than is required in colder latitudes.

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* Morehead's Clinical Researches, page 8, 2nd Edition.

When we enter upon the examination of diseased conditions, it is apparent that they may be studied in two ways :—1*st*, we may inquire into all the circumstances which relate to them, whatever may be the part or tissue affected; 2*nd*, we may confine our examination to them as they exist in any part or organ. For example, we may study inflammation without reference either to the lungs, liver, brain, or any other organ or texture, or we may study it according to its influence upon, or the changes it may effect in, any one of those organs or textures. This has led to the division of Pathology into *general* and *special*. The cure of disease (Therapeutics) is also susceptible of a similar division.

By *general* Pathology and Therapeutics is to be understood the study of those "general facts and doctrines regarding disease and its treatment, which are applicable, not to individual cases only, but to groups or classes of diseases;" and by *special* Pathology and Therapeutics, the study of individual diseases and their treatment.

& Therapeutics The first part of this work will be devoted to General Pathology, the second to Special Pathology. & Therapeutics.

PART I.

GENERAL PATHOLOGY.

In commencing the study of General Pathology, our attention must be devoted to the following points:—1*st*, the nature and constitution of disease (Pathogeny or Pathology proper); 2*nd*, its causes (Etiology); 3*rd*, its prevention (Hygienics); 4*th*, its cure (Therapeutics).

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Before, however, entering upon the study of disease, it will be useful to take a general view of the manner in which it is capable of causing death. This is not an inquiry of merely physiological interest; it has very important practical bearings, as will be hereafter fully elucidated.

When a person in robust health, suddenly struck down by an attack of apoplexy, becomes unconscious and dies in a few hours, it is clear that there is something in the manner of dying different from that of a person who, long suffering from consumption, retains his senses to the last and sinks so gradually, that the moment of death can scarcely be determined. There must be, it is evident, a difference, to say the least, as to the order in which the various vital functions cease, but we shall also find that there is a difference in the commencement or starting point of their cessation.

Modes of Death.—Death may be due to the blood not circulating through the vessels, or not being oxygenated in the lungs; or in other words, to failure of the heart's action,—Syncope—or of the respiratory function,—Apnœa. In disease, death does not usually arise from the direct cessation of one or other of these great functions, but in most instances from the gradual impairment and failure of both, and of other important functions in relation with them. When however sudden, or caused by

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The tendency of disease is to cause death, the

Before entering on the study of disease it will violence; it is not unfrequently traceable to syncope or apnœa alone.

Death by SYNCOPE may be caused by—1*st*, want of sufficient stimulus; 2*nd*, impairment of the muscular fibre of the heart.

1. *Want of Stimulus.—Death by Anœmia.*—The stimulus to the heart's action is defective when a large quantity of blood is drawn from the vessels, or when it is diminished in quantity, or altered in its properties by exhausting discharges; or lastly, when imperfectly formed from failing nutrition and the want of proper food. Death under such circumstances may be sudden or gradual, according to the rapidity with which the stimulus is removed. The more prominent phenomena preceding death by Anæmia, are paleness and coldness of the face and of the skin generally, giddiness, nausea, dimness of sight, a feeble and frequent pulse, restlessness, and transient delirium; and when it is sudden, these symptoms are followed by sighing respiration and convulsions. The organs after death will be found more or less contracted and blanched. In cases where death is sudden, the cavities of the heart are empty; should it have been gradual, they contain blood, and the walls are flaccid.

2. *Impairment of the function of the muscular fibre of the Heart.—Death by Asthenia.*—The function of the muscular fibre of the heart may be impaired or suspended by—1*st*, a sudden shock to the system, producing paralysis of the muscular fibre; 2*nd*, by defective nutrition or changes in the fibre itself.

Of a sudden shock to the system, producing paralysis, we have examples in the effect of violent injuries, as a blow upon the head or at the scrobiculus cordis, severe wounds, &c. Many poisons, which cause death soon after they are taken, probably act in the same way. Mental emotion, when fatal, no doubt is so by causing paralysis of the muscular fibre of the heart. In all these instances the nervous system is more or less involved; but certain poisons, such as that of the upas tree, hydrocyanic acid, &c., act directly upon the muscular fibre, destroying its irritability. Upon examination after death, the cavities of the heart will be found filled with blood; the walls having been unable to contract and expel their contents. But the heart may cease to act from the muscular fibre having become gradually impaired, in consequence of nutrition being generally defective, as for example in exhausting diseases. When persons, reduced by long-continued illness or want of proper food, die suddenly, the immediate cause of death is cessation of the heart's action from impairment of the function of the muscular fibre. So also the muscular fibre may be impaired by the deposit of fatty particles in place of the muscular tissue, as happens in states of fatty degeneration.

Death by APNŒA may be caused by—1*st*, some direct impediment to the admission of air (Asphyxia*); 2*nd*, lesion of that part of the nervous centre which is concerned in the reflex actions upon which respiratory movements depend (Coma).

1. *Death by Asphyxia.*—Air may be prevented from entering the chest by closure of the mouth or nostrils, by strangulation, by the presence of a foreign body in the rima glottidis, by spasm of the muscles by which that aperture is closed, or by pressure upon the walls of the chest and abdomen. It may, also, be excluded by disease of the lungs or bronchial tubes, or by those organs being compressed by tumours or collections of fluid in the pleural sac; and lastly, the admission of oxygen is prevented by the presence of a foreign gas, such as hydrogen, which, although not in itself poisonous, renders a given quantity of atmospheric air deficient in its constituent gases. Death from asphyxia may also arise from obstruction to the circulation of the blood through the lungs, as in certain diseases of the heart.

The symptoms of impending death by apnœa are,—extreme distress, the face bloated and of a purple colour, the eyes injected and prominent, violent action of the respiratory muscles, vertigo, loss of consciousness, and coma. The sphincters afterwards become relaxed, and the heart gradually ceases to beat. In this kind of death the cavities of the right side of the heart are distended with blood, and a small quantity of venous blood is generally found in the left side. The engorgement of the right cavities exists in cases where there has been no mechanical obstruction to the pulmonic circulation, and even when the lungs have been expanded, as, for example, during the inspiration of hydrogen. There has been much discussion as to the cause of the cessation of the circulation in asphyxia. It is probably due to the want of that force ("vis e fronte") which is coincident with the changes that take place between the blood and the oxygen.

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*Asphyxia, though in its etymological signification inaccurate, is so well understood, that I do not feel justified in discarding it.

2. *Death by Coma.*—Death by coma is occasioned by certain morbid states of the encephalon. These in the first instance cause stupor and loss of consciousness; subsequently the reflex actions which are concerned in the respiratory function are no longer effected. Impressions conveyed by the branches of the pneumo-gastric and 5th pair of nerves, do not lead to the generation of motor impulses. The action of the diaphragm ceases, and the chest no longer expands, and, as a necessary result, air is just as much excluded as if there had been a mechanical obstacle to its entrance. So far, therefore, as the circulation through the lungs is concerned, there is no difference between death by coma and death by asphyxia. The cavities of the heart will be equally distended with blood in each case. But between these two modes of death there is this difference:—in the former loss of consciousness precedes, in the latter follows, the respiratory derangement. On this account death by coma is said to be "*death beginning at the head*"; that by asphyxia "*death beginning at the lungs*"; that by syncope "*death beginning at the heart.*"

Whenever there is disease or injury of the upper part of the spinal cord, death by asphyxia may occur without coma, but such cases are not common. More or less coma usually precedes the fatal termination.

It is of much importance, in the management of many diseases, to know the *kind* of death that is to be apprehended; for it will be found, that an essential part of their treatment consists in the adoption of measures which are calculated to maintain and support the function, the failure of which is impending.

SECTION I.

ELEMENTS OF DISEASE.

A DISEASE may be limited to change or derangement of a single function. It is more frequently, however, of a complex nature, being made up of derangements of several functions. For example, inflammation comprises an altered condition of the blood and of the functions of the nervous and muscular tissues. It has indeed been observed, that the component parts of a disease bear something the same kind of relation to it, as ultimate and proximate elements to a chemical compound. Thus, as a general rule, there are simple or primary derangements of function, which are not susceptible of further analysis or simplification; these being associated together, constitute secondary or proximate elements, and by a further combination disease itself. It is therefore desirable, before entering upon the study of disease as a whole, to examine its elementary or constituent parts.

CHAPTER I.

DERANGEMENT OF THE VITAL PROPERTIES OF MUSCULAR AND NERVOUS TISSUES.

THE special vital properties of muscular tissue are *irritability* and *tonicity.*

IRRITABILITY is manifested under the influence of stimuli in two ways:—1*st*, by a more or less continuous contraction of the muscular fibre, *tonic spasm, or cramp*; 2*nd*, by alternate contraction and relaxation, *clonic spasm*, or *convulsion*. belong to

1. *Irritability excessive.*—Excessive irritability becomes apparent—1*st*, in the force and power by which a muscle contracts;

2nd, by a too great readiness to contract; *3rd*, by unusual duration of the contraction.

Muscles act with unusual force in states of mental excitement, as in paroxysms of rage or of mania, or when feats of strength are performed under the excitement of rivalry or emulation. Here, doubtless, the powerful action of the muscles is due more to an increase of motor impulses (in consequence of which a larger number of fibres are excited) than to any augmentation of the force with which individual fibres contract. Inordinate muscular action may also result from the presence of too much arterial blood, as is evident from the violent contraction of the heart which is often present in plethoric states. It is not often that mere exaltation of the contractile power of a muscle leads to serious consequences. It is reasonable, however, to suppose, that continued increased action of the heart may favour the occurrence of those functional headaches, hæmorrhages, &c., which are known to be common in plethoric people.

A much more frequent example of excessive irritability, is an undue readiness or quickness of the muscular fibre to contract. This is observed under many different circumstances, as in the heart, in that condition in which it is said to be irritable; in the bladder, when it is incapable of retaining even the smallest quantity of urine; and in the intestines, when the food passes rapidly through them undigested. In its extreme degree, this condition constitutes convulsion or clonic spasm, as in chorea or epilepsy. Not unfrequently, this state of the muscular fibre is associated with want of power. Thus, the irritable heart contracting with extraordinary frequency and apparent strength, does not expel so much blood as in health, the pulse in the remote vessels being small and feeble.

When the contraction is of unusual duration, *tonic spasm* or *cramp* is said to be present. The most familiar example of this is spasm or cramp of the calf of the leg, which most persons have experienced. But it sometimes happens that the involuntary muscular fibre is affected, and then very serious derangements result. Thus, there may be great difficulty of breathing or of swallowing, from spasm of the muscular tissue of the bronchial tubes or œsophagus, or the muscular fibre in connection with the excretory ducts being implicated, the excretions, as of the bladder or intestinal canal, are retained. The cause of this more or less persistent contraction, may be irregular distribution of blood, or irritation of either afferent or efferent nerves.

2. *Irritability defective or wanting.*—Defective muscular contractility is exhibited by a want of power in a muscle during its action, or by a want of readiness to contract. Of the first, we have an example in the muscular weakness which follows an attack of illness and long disuse of a muscle; of the second, in the sluggishness and torpor which are produced by the action of opium, digitalis, cold, &c. Amongst the causes of defective irritability, are over-exercise or disuse of a muscle, want of a due supply of blood, a shock to the nervous system, the action of sedative poisons, of narcotics, and of cold.

Such are the chief altered states of irritability which constitute disease. It must, however, be remembered, that the irritability of muscular tissue is, in the large majority of cases, excited through the instrumentality of the nervous system, and there must consequently be difficulty in distinguishing excessive or defective irritability from the excessive or defective generation of motor impulses.

TONICITY is the property possessed by all muscles more or less, but in an especial degree by the involuntary muscular fibre, of maintaining a state of permanent contraction not alternating with relaxation. It is by the exercise of this property of the voluntary muscular tissue, that the various postures of the body are maintained during a state of rest, and it accounts for the deformity which is produced whenever one set of muscles is paralysed. It is, also, by reason of the tonicity of the involuntary muscular fibre in the walls of vessels or hollow organs, that they adapt themselves to the varying quantity of their contents, and in this way it probably plays an important part in the performance of various functions. There is a marked distinction between tonicity and irritability in regard to their behaviour under the action of cold and heat. Whilst cold increases tonicity, it diminishes irritability; and whilst heat increases irritability, it diminishes tonicity. This physiological fact has an important bearing upon the occurrence of diseases in tropical countries.

1. *Tonicity excessive.*—When tonicity is generally excessive, the muscles are firm and tense, the pulse is hard to the touch, and there is scarcely any appreciable interval between it and the beat of the heart. The circulation is active and vigorous, but owing to the tense state of the vessels, the secretions are scanty. That condition of the system which is called fever, represents a state in which there is universal increase of tonicity; the skin is dry, the urine scanty, and the bowels constipated. Excessive tonicity has its advantages and disadvantages. Persons in whom it is present less frequently than others, suffer from cold, infectious and endemic diseases, but on the other hand they are liable to hæmorrhages, apoplexy, gout, &c. The causes of excessive tonicity are, as stated by Dr. Williams, "an over-nourishing and stimulating diet, with want of sufficient exercise; a dry bracing air; tonic medicines, such as iron or bark; the excitement of fever, and the occurrence of other disorders in which the blood becomes over-heated or over-stimulating, from the presence in it of irritating matters, such as lithic or lactic acid, and other products of imperfect assimilation, or other results of defective depuration."

2. *Tonicity defective.*—When tonicity is defective, the muscles are flabby, and though wanting in power, easily excited to action. This irritability is well seen in the heart, which is excited and palpitating, but not efficient in circulating the blood, as is evident from the soft and yielding pulse. Owing to the want of sufficient tenseness in the walls of the vessels, the pulse in the radial artery is behind the impulse of the heart. The effects of defective tonicity are often very serious. On account of the blood circulating feebly in important, organs, their function becomes impaired. Thus giddiness, faintness, and even fatal syncope may be produced on slight exertion. The secretions are depraved, sometimes scanty, at others profuse and watery. Want of tone in the alimentary canal causes imperfect digestion and constipation of the bowels, and favours distention by flatus and the accumulation of fœces. In addition to the evils just stated, persons in whom tonicity is defective, are peculiarly susceptible of the action of the exciting causes of all diseases. They are very apt to suffer from malarious, and epidemic, and contagious influences; are easily acted upon

by cold and alternations of temperature, and in consequence often affected with the diseases produced thereby. In tropical countries, diarrhœa and dysentery are perhaps the most common. Amongst the causes of defective tonicity, may be mentioned the want of sufficiently nutritious food, exposure to heat and moisture, the action of malaria and of impure air, and imperfect excretion. In tropical countries many of these causes are combined; as for example, elevated temperature and malaria; whilst in the natives of the country, an imperfectly nutritious diet, and the breathing of an impure atmosphere, may not unfrequently be added.

DERANGEMENT OF THE VITAL PROPERTIES OF NERVOUS TISSUE.

The functions of nervous tissue are chiefly those which are subservient to *sensation*, *voluntary motion*, and *involuntary motion*. They may be so deranged as to be excessive, defective, or perverted. It may be stated generally, that all nervous functions are exalted by an increased, and depressed by a diminished flow of blood through the nervous matter. They are also affected by the quality of the blood, and consequently by all the circumstances which alter the properties of that fluid. Lastly, they are under the influence of certain special agents, as irritants, heat, cold, electricity, mental emotion, &c.

Excessive sensibility.—Sensibility may be either *generally* or *locally* in excess.

Excessive general sensibility is present in all cases where there is an undue quantity of blood circulating through the nervous centres, as in some fevers, and the early stages of inflammatory diseases. Irritation alone, without inflammation, will sometimes produce it, as in tetanus and hydrophobia. There is a state of increased general sensibility, congenital or the result of disease, of which the following are the prominent characters:—The subjects of it are nervous and timid; acutely sensible to all sources of irritation; seldom free from pain of some kind or other, which, though it would be little thought of by other persons, they describe as excessive, because it really is so to them; apt to imagine themselves the subjects of diseases which do not, and to exaggerate the symptoms of those that do, exist; in short, sensation is so heightened, that pain is produced by circumstances which in other persons would merely cause healthy or pleasurable feelings. In dealing with such cases, two errors must be avoided; on the one hand, when real disease is present, we must not overlook or consider it as part of the existing nervous derangement, nor on the other hand over-estimate its severity by reason of the patient's exaggerated description of his sensations. The pathology of this condition should be sought for in derangements of the capillary circulation, in those parts of the nervous centres which are subservient to sensation, in certain mental conditions, and in the presence of something in the blood which is capable of acting as an irritant to the nervous tissue. The more remote causes are congenital peculiarities, excessive mental exertion, ill-regulated moral emotions, derangement of the menstrual secretion, the re-action after profuse losses of blood, sedentary and luxurious habits, &c.

Excessive local sensibility.—The sensibility of a part may be increased (*Hyperæsthesia*) by an altered condition of the sensorium with which it is connected, by some change in the state of the nerve which is distributed to it, or by derangement of its capillary circulation. Inflammation of a limited portion of the brain, or of the nerve, or the pressure of tumours, gives rise to pain confined to the part to which the nerve is distributed. Recent observations have also shown that pain may be of a reflex character: thus, irritation of the peripheral extremity of a sentient nerve will excite pain in a part remote from that which has been the seat of the irritation; further, an abnormal condition, not well understood, of the peripheral extremities of the nerves, will give rise to increased sensibility, as is exemplified in what has been called irritable breast, and irritable testicle. Increased local sensibility is also often due to derangement of the capillary circulation of the part, as is observed in determination of blood, inflammation, &c.

Defective general sensibility.—Deficient general sensibility may be produced at will by the use of narcotics, anæsthetics (chloroform, &c.). It is well marked in many diseases of the nervous centres. It is greatly influenced by the quality of the blood, and is lessened by the retention in that fluid of excremen-

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titious matters. There would appear, also, to be a congenital condition, in which all the sensations are blunted—a condition, indeed, the opposite of that noticed in a preceding clause.

Defective local sensibility.—Loss of sensation in a part (Anæsthesia) is at once produced by cutting off its communication with the sensorium, as by the division of its sensory nerves. Disease (destructive) of a limited portion of the brain has a similar effect. Sensation may also be destroyed or suspended by various agents directly applied, as cold, chloroform, &c. Certain diseases, the pathology of which is not yet ascertained, are attended with loss of sensation; tubercular leprosy may be mentioned as an example.

Perverted sensibility.—Various sensations, of not uncommon occurrence, have been referred to an alteration in the kind, rather than the degree of sensibility, such as feelings of tingling, pricking, the sensation of a ball in the throat, illusions of the special senses, &c. They are often present in hysterical females, and are probably due to irregularity in the supply, or bad quality of the blood distributed to the nervous centres.

Derangements of voluntary motion.—Motor impulses are generated in excess under the influence of various mental emotions, in maniacal states, and in the temporary phrensy caused by alcoholic liquors. In that remarkable condition known as hysteria, the muscular system is often extremely active, the movements, however, being clearly under the influence of the will. On the other hand, voluntary muscular movements are deficient in certain diseased conditions of the nervous centres, and in states of complete intoxication from alcohol or opium. Sometimes they are temporarily suspended by sudden terror, surprise, &c. Perverted muscular movements are not uncommon, and are often associated with defective volition. Defective motive power limited to a part is of frequent occurrence. It is sometimes traceable to disease of the nervous centres, but at others is independent of such disease, as in hysteria.

Altered states of reflex action.—When an impression is conveyed by an afferent nervous filament to the true spinal system, a change is produced in the gray matter, which results in an impulse being generated, to be transferred to an efferent fibre, and transmitted to the muscle to which that fibre is distributed.

Under ordinary circumstances, the impression made upon the nervous tissue, and the motor impulse which is generated in consequence of it, are sufficient and no more for effecting the purpose required in sustaining the economy. But in certain diseased conditions, the susceptibility to impressions, and the power of generating motor impulses, are greatly increased; of this we have examples in hydrophobia, tetanus, and in some forms of epilepsy, chorea, and hysteria. It is a singular fact, that withdrawal of the influence of the will seems to have the effect of exalting the excito-motor functions. Thus, in paralysis of one of the lower extremities, tickling the sole of the foot upon the side affected, will often produce more violent muscular contractions than upon the opposite or healthy side. The condition now under consideration is sometimes produced by the introduction of certain poisons, strychnia, &c.

CHAPTER II.

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DERANGEMENTS OF THE BLOOD.

All nutritive processes and vital actions depend upon a healthy or normal condition of the blood, any considerable deviation from which is consequently an important element in the production of disease. Such deviations are of frequent occurrence. Not only may the blood be changed by a relative disproportion in the amount of its various constituents, but it is liable to be rendered impure by the reception of poisons from without, or by the absorption or retention of matters from within. Moreover, anything which interferes with nutrition is a source of impurity. For it is to be observed, that those constituents of the blood which are separated from it, and applied to the nourishment of the tissues, would, if they were retained, become foreign or poisonous agents.

Unhealthy conditions of the blood sometimes find expression in a general derangement or commotion of the system, as is observed in certain fevers. At other times the morbid effect is localised, disease being set up in a part or organ. Of this, the inflammation of the joints and fibrous tissues which occurs in gout and rheumatism is an example.

The relation between abnormal states of the blood and local diseases, has been the subject of much difference of opinion, and views upon each side of the question, by far too exclusive, have been entertained; the true bearing of a toxœmic condition of the blood upon local derangements has yet to be determined. In the present state of our knowledge, we must be content with the somewhat qualified statement, that whilst some local diseases appear to originate in an altered state of the solids of the body, the greater number are probably preceded by an abnormal condition of the fluids. The properties of the blood may be influenced by—1*st*, a change in the relative proportion of its constituents; 2*nd*, the reception of something from without, either by direct absorption or through the nutritive processes; 3*rd*, accumulations or additions, being the products of the waste or decomposition of tissue, and which should have been eliminated by the excreting organs.

CHANGES IN THE CONSTITUENTS OF THE BLOOD.

Red Corpuscules.—The amount of red corpuscules in health is proportioned to the vigour, strength, &c. of the individual. It consequently varies within certain limits; in some persons not rising above 110, whilst in others it exceeds 150 parts in 1,000.

Red Corpuscules in excess.—Keeping in mind the supposed physiological uses of the red corpuscules, it might be expected that their accumulation in excess would exalt the functions and vital properties of the various organs and tissues. The fact that the excess is usually found in persons of robust and vigorous constitution, seems to show that this is really the case. The term plethora is applied to that state of the system in which, along with the obvious signs of an abundance of red corpuscules, viz. redness (florid) of the lips, cheeks, and gums, the bodily functions and the vital properties of the tissues are exalted. In this condition animal heat is generated in excess; sensation is heightened; the pulse is full and firm; the mental functions are active; the muscular irritability is well marked, and the tonicity of the muscular fibre in a marked degree increased. The plethoric state is not an unmixed evil. Individuals in whom it exists are, it is true, liable to hæmorrhages, and when inflammatory diseases occur, they are accompanied by high febrile excitement, and are often benefited by treatment of a lowering kind, but on the other hand such persons resist many of the exciting causes of disease. The causes of an increase in the proportion of red corpuscules, are food abounding in nutritive matter, too little exercise, and free exposure to a cool atmosphere.

Red Corpuscules in defect.—The red corpuscules are defective in persons who are badly fed, who habitually breathe impure air, and who are deprived of light and exercise in the open air; also in persons suffering from exhausting or incurable diseases, as cancer, diabetes; in the advanced stages of fevers, and in scurvy, &c. They are also in an especial degree defective in diseases which are attended with imperfect depuration, as Bright's disease of the kidney, disease of the spleen, or of the uterus. Lastly, the relative proportion of red corpuscules is lessened by the action of certain poisons, as malaria, lead, and mercury. The effects of a deficiency of red corpuscules will be considered under Anæmia. and the influence of continued high temperat

Changes in the condition of the Red Corpuscules.—The condition of the red corpuscules is probably much influenced by the density of the fluid (Liquor Sanguinis) in which they float. It is found by experiment that, when placed in a fluid of less density than liquor sanguinis, they become larger, lose their flattened bi-concave appearance, and assume a spherical form. On the other hand, in a fluid of greater density they shrink in size and become irregular in shape. It is reasonable to suppose, that somewhat similar changes take place during life under the varying conditions to which the liquor sanguinis is liable. Moreover, changes may occur in the colouring matter of the corpuscules—thus, instead of the bright red hue which it presents in health, it may assume a dark brown, purple, or green colour. This has been noticed in scurvy, malarious and other fevers. In some fevers, with intensely adynamic symptoms, it has been described as quite black. Further, in certain conditions, the colouring matter thus altered appears to leave the corpuscule and even to transude through the coats of the blood-vessels. Thus, the inner surface of the vessels is not unfrequently stained red or purple, and spots or patches of various hues (Petechiæ, Echymoses) are seen upon the skin. It is more than probable, that the passage of the colouring matter from the corpuscules is due to the state of the fluids in which they float, and is in accordance with the well-known physical law of endosmosis. There can be no doubt that the blood corpuscules, like other organic cells, are continually undergoing a process of death and regeneration. Facts have recently been established, which go far to show that in these changes the spleen and liver are intimately concerned; but as to many of the circumstances which influence their production and decay, we are still very imperfectly informed. It is however certain, that their development is impaired by disease of those organs, as well as by everything which interferes with the nutritive processes, or with the depuration of the blood mass. They are also to some extent influenced by special agents—iron has long been known to have the power of favouring their development, and mercury of causing their destruction.

White Corpuscules.—The white corpuscules are increased to a remarkable extent in that peculiar disease which was first fully described by Dr. Bennett, and called by him leuco-cythemia. They are also said to be more numerous in pyœmia, but it is difficult, if not impossible, to distinguish them from pus globules. The white corpuscules were at one time stated to be increased in a remarkable degree in inflammation, and to play an important part in that process. More recent inquiries have shown that, although the proportion is greater than in health, the increase is by no means so great as was formerly supposed. Of any diminution in the proportion of white corpuscules nothing is known.

Liquor Sanguinis.—The liquor sanguinis consists of water, in which certain solid matters, organic and inorganic, are held in solution. Of the organic matters, fibrin and albumen are the most important.

Fibrin.—The use of fibrin in nutrition has been the subject of much discussion; by some it has been considered as the pabulum or organizable material derived from the protein constituents of the food; by others it is viewed as excrementitious, being the result of the decomposition or waste of tissue. Without enumerating the arguments on either side, it may be stated to be beyond dispute that fibrin is not the *sole* plastic or organizable material.

Whatever doubt there may be as to the office which fibrin serves in healthy nutrition, there is none that it is an important agent in reparative processes. It is effused between divided tissues, and forms the uniting medium, and in the case of the nervous and fibrous tissues, is converted into them. But there is no evidence to show that it is capable of forming muscular and cartilaginous tissues.

Fibrin in excess.—The average proportion of fibrin in healthy blood is between 2 and 3 parts in 1,000. It may, however, vary from 2 to 3½ parts, without material derangement of the health. It attains its maximum in health in persons who are well fed and during growth; it is least abundant in weakly people and during infancy, and is remarkably increased in all inflammatory diseases, when it sometimes reaches as high as 10 or more parts in 1,000. It is also in large quantity in acute rheumatism and pregnancy. An excess of fibrin has been noticed in turbercular consumption, but always during the existence of intercurrent inflammation, to which in all probability it is due.

Fibrin deficient.—We assume that fibrin is deficient when blood is unusually fluid and imperfectly coagulable. Tested in this way, it is found to be so in death by asphyxia, or from certain poisons, such as arsenic, sulphuretted hydrogen, &c. There is also evidence of its deficiency in the hæmorrhages and petechiæ which are seen in advanced stages of adynamic fevers. In some of these instances the proportion was as low as 1 part in 1,000; indeed, in one no fibrin could be detected. It has been thought also to be deficient in scurvy, and in animals hunted to death or killed by lightning; but in the latter this is at least doubtful. In epidemic cholera there is invariably a diminution of fibrin, and, which might not have been expected, in cerebral apoplexy.

The effects of a deficiency of fibrin have not been well ascertained; but as it is known that one at least of its uses is to give the blood the degree of consistence or spissitude which specially fits it for transmission through the vessels, various irregularities in its circulation may be expected whenever the proportion is diminished.

COAGULATION OF THE BLOOD.—It is well known, that when blood is removed from the vessels, it begins to separate into a solid and fluid portion. The solid portion, called crassamentum, consists of the fibrin and the greater part of the red and white corpuscules; the fluid of the water, albumen, and salts. The solidification of a portion of the blood is due solely to the property possessed by the fibrin of spontaneous coagulation. Hence, the appearance of the solidified portion—the crassamentum or blood clot—will depend upon the state and quantity of this constituent.

1. When the fibrin and red corpuscules are abundant, the blood clot is large and firm. In this condition of the blood bleeding would be well borne in inflammatory diseases.

2. When the fibrin is deficient or wanting in contractile power, the blood clot is large, soft, and loose. This appearance of the blood contra-indicates the abstraction of blood.

Blood cupped and buffed.—It is often noticed that the blood clot is of small size, very firm, and concave above (cupped), the surface being covered with a layer of a light yellow colour (buffy coat). When blood presents these appearances, the quantity of fibrin, and probably its contractile power, are much increased. The red corpuscules are proportionably somewhat deficient. The cupped and buffed appearance of the blood is in some measure connected with slowness of coagulation. The more slow the coagulation is, the greater will be the contraction. "Hence, as the upper surface of the clot is often formed more quickly than the lower, it is also larger; but the central portions of the large upper layer are drawn downwards by the stronger contraction of the mass below."* The cause of the buffy coat is the subsidence of the red corpuscules, and this of course is favoured by slowness of coagulation, but it is also in part due to—1*st*, an increase in the specific gravity of the corpuscules; 2*nd*, a decrease in the density of the liquor sanguinis. The former is probably brought about by the blood corpuscules being applied to one another by their flat surfaces, so as to form piles or rouleaux—the latter by an increase of the watery constituent. Sometimes a buffy coat forms upon the surface of a clot which is soft and loose and without the cupped appearance. This occurs in persons who are asthenic; such blood is called "sizy."* The cupped and buffed appearance of the blood is often met with in inflammation, and at one time great importance was attached to it, as indicating the necessity for the further abstraction of blood. It is now known that the buffy coat is present in other conditions, and in some of which bleeding is unnecessary and ill borne.

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* Principles of Medicine, Williams, page 162.

Albumen.—It is certain that albumen is of much importance in nutrition, any material alteration in its proportionate quantity will therefore seriously affect the nutritive processes. We do not, however, possess very precise information regarding the minute deviations from its usual proportion. Albumen has been found in excess in many diseases, but such excess does not appear to be characteristic of any particular disease or class of diseases. Thus, the proportion has been above the normal standard in fevers, acute rheumatism, pleurisy, tubercular disease, chlorosis, and apoplexy. Deficiency of albumen is induced by an impoverished diet; but is chiefly met with in connection with disease of the kidneys, during which it is largely excreted by those organs. As it is probable that the degree of viscidity or spissitude of the blood which is favorable for its circulation is in part due to the albumen, any deficiency of that constituent, by impeding its transmit through the vessels, will predispose to the occurence of dropsy.

Fatty matters.—The exact proportion of fatty matter in healthy blood has not been determined. It is probably increased in all cases previous to the deposit of fatty matter, whether into the subcutaneous tissue or into the substance or texture of organs. Occasionally it becomes visible to the naked eye, giving to the serum a whey-like or milky appearance.*

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* In considering the buffed and cupped appearance of the blood, attention must be paid to the manner in which it is drawn, and the kind of vessel into which it is received. When drawn in a full stream into a deep vessel and excluded from the air, coagulation is retarded, and the formation of the buffy coat rendered more certain. On the other hand, if allowed to trickle from a small orifice, and to flow into a broad shallow vessel freely exposed to the air, coagulation is hastened, and the formation of the buffy coat impeded or prevented.

Watery and saline constituents.—The water of the blood is proportionally increased whenever the solid constituents are deficient. It is greatly reduced when there is abundant excretion, as in cholera. An excess of the watery constituent favours the occurrence of dropsies and fluxes; its deficiency renders the blood thick and unfit for free circulation through the vessels. The effect of varying quantities of the water of the blood upon the red corpuscules must not be forgotten. Dr. Williams has hinted, that the serious functional disturbance, sometimes following the ingestion of a very large quantity of liquid, may be due to this cause.† Great stress has been from time to time laid upon deficiency of the saline constituents in certain diseases, as yellow fever, cholera, &c. There is no question that saline matter, added to the blood after removal from the vessels, impairs its coagulability, and it is possible that its loss may favour coagulation within the vessels. Various attempts have been made to supply saline constituents when deficient, by directly introducing them into the blood by injection. The immediate effect of such injections has been sufficient to show that the circulation could be temporarily restored; but inasmuch as in the cases in which the experiment was tried, the cause of their deficiency continued in operation, the relief was only transient.

ABNORMAL MATTERS IN THE BLOOD.

Carbonic acid gas.—Carbonic acid gas in the blood, in any but very small quantity, produces serious derangement. Its presence in quantity would cause speedy death. The existence of this gas is indicated by a dusky hue of the face, lividity of the lips, general distress and difficulty of breathing. Carbonic acid gas accumulates in the blood when air impregnated with it is respired, or when the respiratory function is impaired, as in diseases of the air passages, lungs, or heart; or of the nervous centres, preventing free action of the walls of the chest. The effects of the accumulation bear a close relation to the quantity of blood and the general activity of the functions. Thus, in persons in health a very slight interference with the function of respiration will be attended with the signs of carbonic acid gas poisoning, whilst in consumption and other exhausting diseases, where the quantity of blood is greatly reduced, the greater part of one or both lungs may have been destroyed without any evidence of an excess of this gas in the blood.

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* Transactions of the Medical and Physical Society of Calcutta.

† Principles of Medicine, page 147—180.

Retention of excretions.—The excretions most frequently retained are those of the kidney, liver, and skin. The effects of the circulation of blood thus contaminated will be considered as a part of "Special Pathology."

Matters introduced from without.—There is no question that various matters, more or less noxious, are introduced into the blood along with the food. But a large proportion of gases find entrance through the respiratory organs or skin. Amongst these might be mentioned the infectious principles of many diseases, as of small-pox and other fevers. The cause of the fevers prevalent in this country—malaria—no doubt reaches the blood through the same channels. Other poisonous matters are, perhaps, more directly introduced into the blood by inoculation, as in the bites of snakes and other venomous reptiles. The mode of action of poisons is various, but there is no doubt that one great class have a septic action, destroying vital power and favouring putrefaction of the organic fluids. An important peculiarity of organic poisons is their power of multiplication. The most minute quantity of the virus from a small-pox pustule will, when introduced into the blood of a healthy person, so multiply itself, as to be capable of infecting hundreds and perhaps thousands of other persons.

These then constitute some of the changes to which the blood is liable, from the varying quantities of its own constituents, or from the presence of foreign or abnormal matters. But there is ground for believing that still more subtle influences are capable of so modifying it as to render it diseased. The effect of electricity and heat is well shown in the altered state of the blood when death is caused by lightning or heat-apoplexy. The influence of various mental states has been exemplified in the sudden suspension or vitiation of secretions; as in the change of the properties of the milk in suckling women under the influence of anger.

PLETHORA.

It may be observed, that not only are the constituents of the blood in relation to one another sometimes excessive, but the whole mass of the blood is in undue quantity. This constitutes the state called plethora. Such excess of blood may arise from too much blood having been formed, or too little having been expended; or, as is most frequently the case, from both of these causes. Thus, persons who habitually indulge in a large quantity of nutritious food, and take but little exercise, are apt to become plethoric; provided, however, that the power of digestion and assimilation be unimpaired. Along with an increase in the blood as a whole, there is an abundant development of red corpuscules, and on account of the small proportion which the fibrin bears to them, the buffy coat is never seen. Plethoric people have for the most part a bright ruddy complexion, a full pulse, and an appearance of rude health; but, in truth, they are often on the verge of disease. The heart is oppressed by the large quantity of blood in the vessels—hence excitement of the circulation, palpitation, dyspnœa, &c., are common upon any slight exertion. This condition of the system is rare in tropical countries, except amongst those who have newly arrived—it is extremely rare amongst natives. But there is a form of plethora, which may be called asthenic, which is more frequent. In this there is increased quantity of blood, but the tonicity of the muscular fibre is defective. The circulation is sluggish, the face is dingy instead of red, and the veins are distended; there is sometimes faintness, and the mental faculties are depressed. The muscular power is defective, and activity generally below par. Asthenic plethora seems to be due to defective action of the excreting organs, in consequence of which the blood is insufficiently purified. It occurs in old persons, or in those who have been weakened by previously existing disease, or any other cause of debility.

ANÆMIA OR SPANÆMIA.

In tropical countries a more common derangement is deficiency of the mass of the blood, called anæmia; but as such deficiency is usually accompanied with deterioration of its quality, the term spanæmia has also been applied to it. The blood corpuscules are chiefly deficient; the solid constituents of the serum often being in natural quantity.

Blood may be deficient and altered from being insufficiently formed, in consequence of want of proper food, or from impaired digestive processes; from the withdrawal of it from the system directly, as in hæmorrhages, or indirectly by some exhausting discharge, as pus; and by interference with the process of assimilation, from habitually breathing an impure atmosphere, deprivation of light, &c. Disease of those organs which are believed to be concerned in the formation and disintegration of the red corpuscules (*i. e.* spleen, liver, and supra-renal capsules), is also a cause of anæmia. In tropical countries residence in a malarious district is a very common cause. Lastly, interference with or suspension of excretions, as in Bright's disease of the kidneys and certain uterine derangements, in which the menstrual secretion is scanty or suppressed, often induce it.*

The direct effect of heat, in producing an anæmic state of the system, is shown in the pallor and weakness induced by continual residence in a tropical country, particularly in an atmosphere where heat and moisture are combined.

The appearance of an anæmic person is very characteristic: he is pale or sallow, and the lips are without their usual redness; he is often thin and emaciated, but sometimes bloated or puffy, from effusion of serum into the subcutaneous areolar tissue. The symptoms are weakness, faintness, breathlessness, and palpitation of the heart on the slightest exertion; a feeble and small pulse, cold extremities, loss of appetite, indigestion, scanty secretions, &c. On applying the ear or the stethoscope in the course of the large veins, the blood may be heard as it circulates in the imperfectly filled vessels, causing vibrations (venous murmur), and an abnormal sound may often be detected at the base of the heart (inorganic cardiac murmur).

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* The occurrence of Anæmia, in connection with disease of the supra-renal capsules, will be considered in a future chapter.

The blood of anæmic persons is thin and watery, and manifestly deficient in red corpuscules. In some cases the proportion has been found to be as low as 30 parts in 1,000. The decrease in the proportion of fibrin is by no means equally great, and consequently the blood coagulates with a firm clot, frequently having a buffy coat.

The important bearing of anæmia in diseases of tropical climates can scarcely be over-estimated. Not only is it the chief predisposing cause of these diseases, but it exercises a marked influence upon the phenomena they present, and upon the action of the remedies which are employed for their cure.

CHAPTER III. Very good

DERANGEMENTS IN THE CIRCULATION OF THE BLOOD.

DERANGEMENTS in the circulation of the blood are either *general* or *local*. General derangement, connected with or dependent upon disease of the heart, will form a part of *Special Pathology*.

Pulse.—We become aware of general derangement of the circulation by examining the pulse. The pulse is the sensation felt when one or more fingers are placed over an artery during the contraction of the heart. It is caused by temporary increase in the size and length of the vessel. In arteries near the heart it is synchronous with the contraction of the ventricles or systole of the heart; in arteries at a distance it is little later, but the difference is scarcely appreciable by ordinary observation.

The information afforded by the pulse has reference to—number, size, density, regularity, and nature of the beat.

Number.—The number of times the pulse can be felt in a minute varies at different periods of life, in different persons, and in the same person at different times. At birth it beats about 140 times in the minute. From birth to moderate old age it diminishes in frequency, but undergoes a slight increase during decrepitude. The following may be taken as averages:—

Birth	140
Infancy	120
Childhood	100
Youth	90
Adult Age	75
Old Age	70
Decrepitude	75—80

In females it is somewhat more frequent than in males.

The frequency of the pulse is increased by exercise, by the erect posture, by mental excitement, by heat, and by the use of animal food and alcoholic liquors. It falls during sleep and continued rest, under the influence of depressing passions, and the application of cold. It is rather more frequent in the morning than in the evening. The frequency of the pulse in disease is subject to much variety, sometimes rising as high as 150 or 200, or falling as low as from 15 to 20 beats in a minute.

Size.—The size of the pulse is due to the quantity of blood which is propelled from the heart during each of its contractions. Thus, it may be large or small, giving a sensation of fulness, *a full pulse*, or of smallness or emptiness, *a small pulse.*

Density.—The firmness or hardness of the pulse is due to the elasticity and tonicity of the blood vessels. When these are increased, it is hard and incompressible; when diminished, soft and compressible. Different degrees of hardness, fulness, and softness, are denoted by the expressions wiry, weak, &c. When elasticity is altogether lost in the larger arterial trunks, the pulse is thrilling, jerking, or vibrating. A thrilling character of the pulse is also produced by a thin and altered state of the blood, as in anæmia.

Regularity.—In health the interval between any two beats of the pulse is precisely the same. In certain diseases it varies by being either lengthened or shortened, the pulse is then said to be *irregular*. At times one beat seems to be lost, this may happen at regular intervals; the pulse is then *intermittent*. Should the same thing occur at irregular times, it is *irregularly intermittent*. When the size of the pulse varies during different pulsations, owing to varying quantities of blood being expelled from the heart, it is said to be *unequal.* *Slowness* and *quickness* of the pulse relate to the time occupied by each beat of the heart.

The characters of the pulse above described are seldom observed alone. For example, we meet with a pulse which is *full* and *hard*, or *small* and *weak*, or *frequent* and *wiry*, or *frequent* and *soft*, and so on.

DERANGEMENTS OF THE CAPILLARY CIRCULATION.

The capillary circulation is liable to frequent disturbance. Within certain limits such disturbance may exist without disease, as is in the turgescence of the mammary gland during lactation, or in the shrinking or collapse of the skin under exposure to cold. It often happens, however, either from some peculiarity of the exciting cause, or from the intensity and duration of the derangement, that the boundary of health is passed, the nutrition or function of the part or organ being in a greater or less degree impaired.

The accumulation of blood in the capillaries is invariably accompanied by an altered rate of movement. Thus the velocity of the circulation may be increased or diminished, or in part increased and in part diminished. Founded for the most part upon these varying conditions of the movement of the blood, three states of capillary derangement may be distinguished. 1*st*, congestion; 2*nd*, determination of blood; 3*rd*, inflammation.

Congestion.—The blood increased in quantity and circulating with diminished velocity.—Congestion in external parts is made known by swelling which pits on pressure, redness of a dusky or dark purple hue, and slight loss of temperature. In internal parts, which are neither visible nor amenable to touch, by derangement of function and altered states of sensibility. For example, in congestion of the kidney the urine is changed in its properties, and a dull aching pain is felt in the loins. The vessels which are distended in states of congestion are the small veins and the capillary net work immediately contiguous to them. The small arteries certainly, and probably also the adjacent capillaries, are unaffected. The accumulation of blood being for the most part in the venous radicles, explains the dark or dusky colour of the redness. Retardation of the circulation after the blood has lost its arterial character, sufficiently accounts for the functional disturbance to which congestion gives rise.

The more common causes of congestion are mechanical obstruction to the return of blood to the heart, and deficiency of the propelling powers of the circulation, *i. e.* a feebly acting heart, or a relaxed or toneless or atonic state of the vessels.

Mechanical obstruction may be caused externally by the application of a ligature, as in tying up the arm for the performance of venesection, or by the pressure of a tight neckcloth. Internally it may be due to the pressure of a tumour, the deposit of exudations from the blood into various organs, disease of the valves of the heart, &c. Everything, indeed, which impedes the flow of blood through the lungs, mechanically obstructs its passage through the veins; such, for example, as fits of coughing, straining, holding the breath, asthmatic paroxysms, and the like. Congestion from feebleness of the heart's action is common in the advanced stages of adynamic fevers and in extreme debility from any cause. The blood accumulates in largest quantity in those situations, from which it has to ascend against its own gravity.

Local congestions are not unfrequently independent of feebleness of the heart's action; in such cases, the most common cause of the atony of the vessels is over-distension. This may be the result of position, as in the feet of persons who have been long standing, or in the head when it has been allowed to hang too low. In other instances it is the result of a previous attack of inflammation; of this the congested state of the conjunctiva after conjunctivitis is an example. Sometimes over-distension of the vessels of internal parts is caused by cold. The immediate effect of cold is to constrict the vessels to which it is more directly applied, and, as a consequence of this, to determine blood to those at a distance. Hence, internal congestions from an atonic state of the vessels, the result of over-distension, may be traced to exposure to a low temperature.

The influence of malaria in causing congestion is well known but the precise mode of its action is uncertain. This much is well ascertained, that its operation is sometimes independent of the occurrence of febrile symptoms. Loss of nervous influence also leads to congestion, as is exemplified in the conjunctiva, when the function of the trigeminal nerve has been destroyed. Lastly, congestion may be due to the suspension of the force which is generated by the mutual actions that take place between the blood and the tissues through which it is passing; the arrest of the circulation in asphyxia, and in an organ the secretion of which has been from any cause greatly diminished, may be mentioned as well-marked examples.

Determination of Blood.—The blood increased in quantity and circulating with increased velocity.—Determination of blood is often a physiological process, as in the uterus, breast, and gums during pregnancy, lactation, and dentition. The point at which it ceases to be physiological and becomes pathological, is not always easily recognised. It may, perhaps, be stated generally, that so long as the vigour and energy of the function of the part keeps pace with the quantity of blood which is directed to it, the limits of physiological action are not passed, but whenever there is a want of relation between them, the process becomes pathological. Determination of blood to an organ is excited by everything which inordinately exalts its function, as in the brain under violent mental exertion. Paroxysmal attacks of nervous diseases are often preceded by it. But it is most common from the action of stimuli, as in the use of purgatives, diuretics, &c. In the great majority of cases it is the first step in the inflammatory process.

The symptoms of determination of blood, in contradistinction to those of congestion, are characteristic of excitement or excess of action. Thus, the temperature of the part is raised and its sensibility increased, as is evidenced by a feeling of heat and throbbing. The vessels which are dilated are the small arteries and the adjacent capillary network.

The cause of determination requires careful examination. So long as the derangement is localised, it is plain that we must not seek for its cause in any undue excitement of the action of the heart, for this would produce general and not local determination. Neither can we refer it to the action of the vessels, for it is at least doubtful if they possess such power of alternate contraction and relaxation as would assist in the circulation of the blood. The increased size of the vessels may account for the quantity of blood, but by no means for the rapidity of its circulation On the contrary, this might rather be supposed to retard it, just as the current of a river is lessened by its expansion; but the researches of Mr. Paget and others have shown that the velocity of the circulation is in no way dependent upon the size of the vessels. The observations of the most recent observers seem to point to a modification of what has been called the nutritive tissue force as the essential and immediate cause. It is well known, that determination of blood may be artificially produced. When the point of a needle is applied to the web of the frog's foot, the arteries are seen to dilate and the flow of blood through them to be accelerated. Some of the capillaries also become dilated, and many which before were scarcely large enough to admit any corpuscules, receive them in considerable numbers. Should the irritation be continued, other changes occur which will be presently described. It is quite conceivable, that the effect of the stimulus upon the molecules of the tissue may be to exalt the attractive force which subsists between them and the blood, and thus to draw an increased quantity of blood towards the part which has been irritated. The effect of this upon the vessels must almost necessarily be their dilatation. At the same time it cannot be doubted, that determination of blood and dilatation of the vessels may, under certain circumstances, be due to an altered state of innervation. The fact that division of the pneumogastric nerve has been followed by determination of blood to the lungs and stomach, and of the sympathetic of the neck to the eye and ear of the same side, is quite sufficient to establish this point.

Effects of Congestion and Determination of Blood.

After blood has accumulated in the vessels of a texture, it may in whole or in part escape from them. Such effusions constitute hæmorrhage, flux, and dropsy.

Hæmorrhage.—By hæmorrhage is to be understood the effusion of blood in mass; the mere discharge of hæmatine is not hæmorrhage. There being neither pores nor openings in the coats of the vessels, it is clear that hæmorrhage cannot occur without rupture, notwithstanding that breach of texture is not always detected. The effects of hæmorrhage vary according as it occurs in the substance of a parenchymatous organ or upon a free surface. *In the former* the blood tears and lacerates the tissue, coagulates and acts as a foreign body, thereby exciting inflammation, and in certain delicate organs, as the brain, causing such an amount of pressure as to derange or suspend its function. *In the latter* the injurious effects depend simply upon the quantity of blood that is withdrawn from the vessels.

Hæmorrhage into the substance of an organ produces a sort of space or cavity, the walls of which are irregular and ragged. For a time the blood is liquid, but it afterwards coagulates and assumes various hues, from dark red to blue or yellow; these are well seen in a common bruise. The fibrin and broken-up-tissue soften down by fatty degeneration and are absorbed. The blood corpuscules become massed together, shrink and diminish, until minute granules alone remain; sometimes they are enclosed in a cyst formed by a plastic effusion into the surrounding tissue. Occasionally the sides of the cyst fall together and the cavity is obliterated. In rare cases the coagulum may became organized.

The symptoms of hæmorrhage should be divided into those which are due to the injury inflicted upon tissue, and those which arise simply from loss of blood. The former will of course vary according to the seat of the hæmorrhage. In delicate organs the injury suddenly occasioned may act in the way of shock, and cause death by syncope. When the effusion is more gradual, the function may be slowly deranged or suspended, or inflammation excited.

The symptoms of bleeding from a free surface, from which the blood can readily escape externally, as the uterus, lungs, stomach, &c. have reference to the quantity of blood discharged. The earlier symptoms are more or less familiar to all persons—the pallor of the surface, the gradual failure of the pulse, the feeling of giddiness, and the faintness or syncope. Should the hæmorrhage continue, other symptoms are superadded, viz., restlessness, jactitation, frequent sighing, cold sweats, involuntary passage of fæces, convulsions, and death.

When the discharge of blood has been excessive, or even when it has been moderate in certain states of the system, the re-action is characterised by unusual symptoms. The skin becomes above the natural heat, the pulse is frequent, and the pulsation of the carotid arteries very distinct or even violent; the patient complains of headache, noises in the ears (tinnitus aurium), and intolerance of light and sound. These symptoms are in some respects not unlike those which indicate mischief within the head, but it would be a very serious mistake not to discriminate them. By noticing that the pulse though frequent is easily compressible, and that the face and lips are blanched,—that the symptoms are greatly aggravated in the sitting or erect posture, and by further inquiring into the previous circumstances of the case, a correct opinion can always be formed.

Hæmorrhage may occur in strong and robust (plethoric) persons, who live well and take little exercise. It is then often preceded by a sense of fulness and uneasiness and redness in the part or organ from which the blood is to escape. With these signs of local determination, there are others which indicate languid or feeble circulation in remote or distant parts, as for example, chilliness, coldness of the feet or hands, paleness and shrinking of the skin. After a time, however, a sort of re-action sets in, the skin becomes hot and the pulse frequent, full, and bounding; at length the blood is poured out with rapidity, is of a fluid red colour, and readily coagulates. So long as the discharge is moderate, and can easily escape, no attempt should be made to restrain it. The patient, indeed, feels considerable relief during its discharge, and stronger and better afterwards; as a general rule it effects its own cure, ceasing when the plethora or over sthenic state of the system which led to it has been removed.

But hæmorrhage often occurs under very different or indeed opposite circumstances, viz., in persons reduced by long-continued illness, great fatigue, insufficient food, depressing passions, and the like. As might be expected, it is not preceded by the symptoms which usher in sthenic hæmorrhage; the blood, which frequently escapes from several parts of the body at the same time, is thin, of a dark colour, and indisposed to coagulate. In these cases we must not expect that the hæmorrhage will speedily cease of its own accord; on the contrary, the greater the quantity of the blood that has been lost, the more is the system rendered favourable to the continuance or the recurrence of bleeding.

This kind of hæmorrhage is most frequently caused by congestions from mechanical obstruction, occurring in persons whose blood is deteriorated. Obstructive or regurgitant disease of the mitral valve of the heart leading to hæmorrhage into the lungs (pulmonary apoplexy and hæmoptysis), cirrhosis of the liver to hæmorrhage from the stomach and bowels (hæmatemesis and melœna), or from the hæmorrhoidal veins (hæmorrhoids), are examples. Hæmorrhages not unfrequently arise from disease of the coats of the vessels, in consequence of which they become brittle. One form of apoplexy (cerebral hæmorrhage) is due to this condition; or the coats of the vessels previously healthy may be destroyed by an ulcer extending into them, as happens in ulcer of the stomach, dysentery, &c. Lastly, hæmorrhages can often be traced to an altered state of the blood.

Flux and dropsy.—It is not however always, nor indeed generally, that an accumulation of blood leads to hæmorrhage—much more frequently a part only of the constituents of the blood transudes through the coats of the vessels. The watery part, holding organic and saline matters in solution, is often thus effused into closed sacs or connective areolar tissue (dropsies), or upon free surfaces, or in secreting glands (fluxes); in the latter case the fluid, separated from the blood, becomes mixed with the mucous or other secretions from the structures upon or into which it may have been effused.

Flux and dropsy are the result of determination of blood and congestion. Whilst, however, flux is frequently traceable to determination, and often therefore active, dropsy is very generally due to congestion, and consequently passive. As examples of flux may be mentioned the discharge from the Schneiderian membrane in simple catarrh, and the profuse evacuation of fluid in choleraic diarrhœa; as examples of dropsy, œdema of the feet in a weakly person, and the general swellings in obstructive disease of the heart. Notwithstanding the apparent difference in the phenomena of flux and dropsy, they have much in common. They are each due to accumulation of blood in the capillary vessels, and to the transudation of its serum. They are often produced by the same exciting causes, and occur in very similar states of the system. Flux is very common amongst the natives of tropical countries, and often traceable to the debility resulting from long-continued attacks of intermittent fever. Doubtless, in these cases, it may be ascribed to an atonic condition of the vessels, and a thin or altered state of the blood.

Dropsy also is not uncommon in similar conditions, but is more frequently due to mechanical obstructions to the passage of the blood through the veins, as in valvular disease of the heart, cirrhosis of the liver, &c.

The details in connection with flux and dropsy will form a part of Special Pathology.

CHAPTER IV.

Excellent

DERANGEMENTS IN THE CIRCULATION OF THE BLOOD—*(continued).*

The derangements of the circulation which have been hitherto considered, admitted of a clear and precise definition. But we have now to notice a condition, our acquaintance with which is imperfect, and which cannot therefore be satisfactorily defined. The definition given below is, perhaps, the least open to objection; but it must be clearly understood, that this may turn out to be incomplete or even incorrect.

INFLAMMATION; *increased quantity of blood; movement in part accelerated in part retarded.*—There is no subject in the whole range of Pathology that has such important relations as inflammation. Few diseases of a serious nature are unconnected with it, either at their onset or in their progress, and still fewer terminate fatally in which the fatal result is not mainly due to it. Great, however, as is its influence for evil, inflammation has also its influence for good. It is the medium through which many injuries are repaired; by it alone collections of pus in internal parts, or the contents of the hollow viscera, are prevented from being discharged into the great serous sacs, and by artificially exciting it (as in hydrocele), a long standing disease is often cured.

State of the circulation in the inflamed part.—It is quite certain, that inflammation is preceded by determination of blood or congestion. The arteries are, indeed, seen to be enlarged, and observations have been made which prove, without the possibility of doubt, that an increased quantity of blood is contained in them. But the rapidity of the circulation in the small vessels ceases so soon as the determination has passed into inflammation, though the vessels continue to be dilated. But whilst in the focus of the inflammation the blood is stagnant, it is by no means so in the vessels immediately surrounding it. There, the two states of congestion and determination of blood are present. It is upon these facts that the statement is founded, of the movement of the blood in inflammation being partly increased and partly diminished.

The capillary circulation has been carefully examined, when inflammation is present in transparent parts of certain of the lower animals. Determination of blood having been induced by an irritant, the current soon begins to slacken, and becomes slower and slower, until all circulation ceases. At the same time the blood loses its ordinary appearance—the row of corpuscules which occupies the centre of the current increases in width, until it fills nearly the whole of the vessel. The corpuscules being thus crowded together, lose all individual form, and the vessels appear to be filled with a motionless and solid red substance. Whilst these changes are occurring, equally great changes are taking place in the blood itself. Certain of its constituents in a state of solution pass through the coats of the vessels and become effused into the meshes of the tissue, occupying the place of the nutritive fluid, which in the healthy condition separates from the blood for the purposes of nutrition. Both these fluids bear a general resemblance to the "liquor sanguinis," but that which is effused in inflammation, is remarkable for containing an excess of certain constituents (chloride of sodium and phosphates), and for the presence of a great abundance of organic elements. In most cases some of the vessels are actually ruptured and blood corpuscules escape.

Vessels.—As accumulation of blood seems essential to inflammation, it is clear that the vessels must be enlarged. The enlargement includes the small arteries, capillaries, and veins. No new vessels are formed, but many which were invisible become apparent from the entrance of red corpuscules into them. The enlargement of the vessels is generally accompanied by a change of shape. On account of being elongated as well as dilated, they appear wavy or tortuous. At times, also, the dilatation is irregular, which gives them a varicose appearance ; but this does not seem to be essentially connected with the inflammatory process, as it is present in other than inflammatory conditions. It thus appears, that when inflammation is fairly established, the blood vessels are dilated and filled with stagnant blood rich in corpuscules, some of the constituents of which have transuded through the coats of the vessels.

There are two points in this process which have attracted much notice, viz., the cause of the dilatation of the vessels, and of the stagnation of blood within them. Various hypotheses have from time to time been offered to account for these phenomena. None of them are free from objection, whilst some have been finally set aside by the revelations of the microscope. Whatever may be the cause of the dilatation, it seems quite certain that the change in the velocity of the circulation is not solely due to an alteration in the capacity of the vessels. Still less can it be wholly referred to an altered condition of the blood, or indeed to any physical cause. It must, therefore, be in some way influenced by the tissues external to the vessels. That there does exist between the molecules of the tissues and the blood which circulates through them some kind of relation which favours the passage of the blood, is now a well ascertained fact in physiology. How far disturbance of this relation may act in retarding and ultimately stopping the circulation, is yet to be determined. All that in the present state of our knowledge can be safely affirmed is, that such a supposition more readily explains the phenomenon than any other that has been adduced.

State of the blood.—The changes in the blood have been already noticed. In addition it may be mentioned, that the red corpuscules are at first increased in quantity, but afterwards diminished, so as to fall below the natural standard. They show a disposition to cohere by their flat surfaces. The white corpuscules are also in excess, and it is said that they adhere to the sides of the vessels ; this, however, requires further investigation. But the most remarkable change is in the fibrin, the proportion of which may rise from 2½ to as many as 10 parts in 1,000. The proportion of albumen and saline matters is lessened, whilst the watery constituent is augmented.

Exudations.—It has been already stated that, after inflammation has been set up, a fluid resembling liquor sanguinis transudes through the vessels. The fluid portion of this exudation may be removed by absorption, and the fibrin which remains slowly coagulate ; this solid residuum is known as coagulable lymph. Sometimes the fibrin may remain for a long time in solution, showing no disposition to coagulate, until it has been removed from the body. Not unfrequently the effused fluid contains blood corpuscules, from rupture of some of the capillary vessels. There are two constituents in these inflammatory exudations, viz., the *corpuscular* and *fibrinous*, the relative proportion of which often determines the behaviour of the exudation. The corpuscular element consists of cells of various kinds, some in process of development, others of degeneration. The fibrinous element differs in no way from the fibrin of the blood.

In their most simple form, the corpuscules resemble those of chyle. In the progress of development they assume various forms, characteristic of the tissues into which they are sometimes converted. But when no such transformation is to take place, they appear as granule-cells, pus-globules, molecules, &c. It has been ascertained, that the larger the proportion of the fibrinous constituent, the greater is the probability of the exudation becoming organized into some form of tissue, and the larger the proportion of the corpuscular element, the greater the probability of its conversion into pus. It is, therefore, very material that we should be aware of the circumstances under which a relative disproportion of these constituents may occur.

The researches of Mr. Paget leave no doubt that the state of the blood influences the character of the exudation. In cachectic or weakly states of the system, the lymph is rich in the corpuscular element, shows little or no disposition to be organised into tissue, and is, as a general rule, readily converted into pus. On the other hand, in purely local inflammations in healthy persons, the exudation coagulates into a filamentous mass, in which a few corpuscules may be entangled. The nature of the inflamed tissue has a still closer bearing upon the character of the exudation. In inflammation of serous membranes, even in cachectic individuals, the fibrinous constituent predominates. In inflammation of mucous surfaces, the corpuscular constituent holds the chief place, the effusion being rapidly formed into pus. At the same time it must be acknowledged, that other determining influences (*i. e.* the state of the nervous system, &c.) may so far modify the nature of the exudations in inflammation of a particular texture, as to afford many exceptions to any general statement upon this point. Lastly, the kind of lymph effused is influenced by the intensity and peculiarity of the inflammation.

Changes in the inflamed textures.—It is scarcely to be expected that the tissue should remain unchanged during these disturbances of the capillary circulation. Infiltrated with deposits from the blood, and without nutritive material, the molecules or even masses of texture are destroyed, and separating from their connections, become mixed as "debris" with the exudations. In the centre or focus of the inflammation the process therefore is plainly destructive, but towards the edge or circumference, cells are met with in various stages of development or degeneration, until at length the healthy tissue is reached. In contradistinction to what is taking place in the centre, the process may be here called productive, though the attempt is for the most part abortive.

There would thus appear to be much that is common to both inflammation and nutrition; in each the processes are destructive and productive, and in each the changes are in part effected by the development of cells in a blastema which has been separated from the blood. But there is this difference—so long as the inflammation continues, the cells do not reach a higher development than that of "pus cells;" they are not converted into tissue, and soon, by a process of degeneration or decay, are broken up and disintegrated.*

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* Simon. Holme's System of Surgery, Vol. 1, pp. 29 and 30.

Symptoms of inflammation.—When an external part is inflamed, it is *red*, *swollen*, *hot*, and *painful.*

Redness.—Redness is for the most part essential to inflammation, although it varies much in degree, according to the vascularity of the inflamed tissue and other circumstances. It is chiefly due to the increased number of red corpuscules with which the vessels are filled, but in part also to effusion of blood from rupture of capillary tubes, or in certain cases from transudation of the colouring matter of the blood. By careful examination, the redness from distension and from rupture or transudation can be distinguished. In the former it disappears for a time on pressure, in the latter it undergoes no change. There is much difference in the tint of the redness ; it may vary from a bright crimson to a dull purple. This depends upon the state of the circulation and of the constitution of the patient. Where determination of blood predominates over congestion, as it usually does in healthy robust individuals, the redness is bright and florid. Where congestion is in the ascendant, as in impaired states of the system, it is dark and sometimes livid. In inflammation of certain tissues, it can scarcely be said that there is any redness; in the iris for example, the colour is rather brown than red, and in some mucous membranes it is even of a gray or slate colour.

Swelling.—The accumulation of blood, and the effusion of some of its constituents into the meshes of the inflamed part, must necessarily give rise to swelling. This is, therefore, an invariable accompaniment of inflammation, but inasmuch as the exudations are the chief factors, the amount of swelling must vary according to the degree to which the inflamed textures are capable of retaining them within their substance. In inflammation of mucous membranes, from the surface of which they readily escape, the swelling is comparatively inconsiderable, whilst in inflammation of the areolar tissue it is often very great. The degree to which the swelling is externally manifested, depends in some cases upon the rigidity of the part ; thus, there may be exudations poured out internally, as in bones, which do not cause external swelling—the medullary membrane may be swollen without external enlargement.

Pain.—Pain, which is present in almost all attacks of inflammation, is due to increased nervous sensibility, pressure upon the nerves in consequence of the dilated condition of the vessels, and destruction of the nerve fibrils in the more advanced stages. The degree of pain is not in proportion to the extent of the inflammation, but is rather related to the kind of tissue which is inflamed. In unyielding tissues, such as dense fibrous or bony, the pressure upon the nerves is great, and therefore the pain severe and agonizing, even when the extent of inflammation is very limited. Good examples of this are inflammations of the tooth pulp, or of the tympanum of the ear. Inflamed mucous membranes are often attended with but little pain in the membrane itself, although there may be a good deal from spasmodic contraction of the muscular tissue which is usually in relation with them. Nor, it must be observed, is the amount of pain at all times proportioned to the severity or danger of the inflammation ; in some destructive forms of inflammation of the peritoneum, pain can hardly be said to exist.

Just as pain varies in degree, so does it also in kind. When unyielding tissues are inflamed, it is throbbing or pulsatile; in inflammation of the skin or mucous membranes itching, tingling, or burning; of serous membranes stabbing or lancinating; of bones aching. Sometimes it is not confined to the inflamed part, but radiates beyond it, whilst occasionally in the organs of special sense, special sensations are produced. Thus, in deeply-seated inflammation of the eye there are flashes of light; of the ear abnormal sounds; of the bladder frequent calls to discharge the urine.

Heat.—The temperature of an inflamed external part is raised, but it has been thought not to rise above that of the blood, and consequently, as internal parts are always of that temperature, inflammation of them is not accompanied by increased heat. Recent experiments have, however, satisfactorily shown, that the blood flowing to and from an inflamed part, is of lower temperature than that in the focus of the inflammation.* It is therefore certain, that heat is in some way or

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* Simon. Holme's System of Surgery, Vol. I., pp. 42 and 43.

other actually generated in the seat of the inflammation. But the sensation of heat experienced by the patient, is much greater than the comparatively slight increase of temperature, as indicated by the thermometer, would be sufficient to explain. The cause of the rise of temperature is in the first instance the influx of blood, but afterwards changes in the nutrition of the inflamed texture.

Now, it may be remarked, that valuable as a knowledge of these four cardinal symptoms undoubtedly is, yet by them alone we should not in many cases be able to discover the presence of inflammation in internal organs. In inflammations within the head for example, the only one of these symptoms that would be apparent is pain, and in those of the other great cavities, redness always and swelling often could not be made available. We have, therefore, to take into consideration other circumstances which are intimately connected with the inflammatory process. From what has been stated in regard to the capillary circulation, it is evident that inflammation cannot occur in any organ without more or less derangement of its function. If the lungs for example be inflamed, respiration will be impeded; inflammation of the kidney leads to diminution in the quantity or suppression of the urine, and of the heart to derangement of the circulation. Such derangements constitute our most important means of localising the inflammation in internal organs.

But we have still another means of ascertaining the presence of inflammation. It is often found to be associated with that general derangement of which increased heat is the most certain and characteristic symptom, and hence called fever or feverishness. The main or leading symptoms of this state are heat of skin, frequency of pulse, derangement of the nervous functions, and more or less suppression of the secretions; but as the extent to which particular derangements exist varies in different cases, a detailed description becomes necessary.

Sthenic or sympathetic inflammatory fever.—When inflammation occurs in a robust sthenic individual, is produced by the ordinary causes, and is not very extensive nor inordinately violent, the constitutional disturbance presents the following characters:—the skin is pungently hot and dry, the mouth parched, the urine scanty and high coloured, the tongue furred, and the bowels constipated. The sleep is disturbed, and there is intolerance of light and sound. The patient complains of pain of the back and headache; the pulse is always frequent, generally full and firm, but in regard to the two latter characters, much will depend upon the tissue which is affected. In inflammation of a serous membrane, the pulse, though hard, is small and wiry, and of a mucous membrane, though full, easily compressible. These are the symptoms of a typical case of *sympathetic inflammatory fever*; but they are not often met with in medical nor even in surgical practice in tropical countries. The fever which accompanies local inflammation in the natives of, or long residents in, tropical countries, is a modification of the above. The skin though hot is not pungent, and there is in general a marked difference between the heat of the trunk and extremities; the pulse is soft and often small, the tongue but little furred, and not unfrequently florid at the tip and edges. The bowels are seldom constipated, are very easily acted upon by purgative medicines, and apt to become loose should too active purgatives be administered. It is not uncommon for this variety of fever to assume a remittent or even intermittent character.

Asthenic fever.—When inflammation attacks persons whose constitutions have been broken down by privations, previous disease, dissipation, or indeed by any of the depressing causes of disease, the febrile symptoms are greatly modified. The attack is usually ushered in with a stage of depression from which re-action is slow and seldom complete; the patient is dull and apathetic, not unfrequently delirious, the delirium being of a low muttering kind; the skin of the trunk is often not much above the natural heat, that of the extremities is frequently below it, and in many cases it is covered with a cold clammy sweat. The pulse is frequent (100 to 120), feeble, and small, and the tongue brown and dry; sordes rapidly collect about the teeth; the bowels are seldom constipated, and are often loose, the diarrhœa alternating with profuse sweating. In a more advanced stage the pulse becomes still more frequent and feeble, the skin cold, and the tongue more dry; the sordes increase; hiccup, dyspnœa, and coma precede the fatal termination. In favorable cases, critical evacuations from the bowels, sometimes hæmorrhagic, are co-incident with a gradual abatement of the symptoms, which is followed by a progressive though slow convalescence.

The sthenic forms of sympathetic fever may assume this asthenic or adynamic character, from extension of the inflammation, contamination of the blood from absorption of some of the effusions, or over-activity in the adoption of depleting measures in its treatment.

Hectic fever.—In the advanced stages of inflammation, or even in the earlier stages under certain circumstances, the constitutional disturbance is frequently very different from that above noticed. It is characterized by paroxysms of fever occurring at irregular periods, and attended by profuse sweating. The fever is of a remittent and sometimes of an intermittent type. It generally sets in with chills about the middle of the day. Towards evening the skin, particularly of the palms of the hands and soles of the feet, becomes hot and dry, and the face flushed. The pulse rises in frequency, being often 120 in the minute; the mouth is dry and parched, and there is much thirst. At an uncertain time profuse sweating occurs and lasts till morning, leaving the patient feeble and languid, but without febrile symptoms. The pulse, however, is not reduced to its natural frequency, and becomes much accelerated upon the slighest exertion. The period of accession is very various; sometimes it is early in the forenoon, more frequently in the afternoon or evening. The degree of heat is also subject to much variety; occasionally it is general and intense, not seldom confined to mere flushing of the face and palms of the hands. There is usually a daily paroxysm; in some instances there are two paroxysms. When the hectic has existed for a considerable time, the patient becomes much emaciated, the tongue florid at the tip and edges, and attacks of diarrhœa alternate with the night sweats. The appetite is seldom much impaired, and not unfrequently it is voracious. The nervous system is not implicated; delirium is rare. No limit can be assigned to the duration of hectic fever; its removal must depend upon the nature of the local cause to which it is due.

Hectic fever is often present along with profuse suppuration, and on that account it has been thought that the absorption of pus is its main cause; but there is no reasonable ground for such belief. It is not uncommon in the earliest stages of phthisis, and in scirrhus tumours before suppuration has commenced.

RESULTS OF INFLAMMATION.—The results of inflammation are—

1. Resolution.
2. Effusion, adhesion, and suppuration.
3. Ulceration.
4. Mortification.

Resolution.—By resolution is understood the termination or cessation of the inflammation; the heat and pain first, and afterwards the swelling and redness, subside. The miscroscope shows, that as the symptoms are removed, the blood circulates in the obstructed vessels, which contract to their normal size. In some of the vessels, however, the current of the circulation remains slow and the vessels dilated; a state of congestion which may be only very gradually removed.

Along with the subsidence of the local symptoms, the fever diminishes more and more until it altogether disappears; the pulse becomes soft and less frequent; the skin cool and perspiring; the urine abundant, throwing down a copious reddish or brown sediment of lithates, and containing a large proportion of urea. In some instances resolution may occur suddenly, and the inflammation be set up in some other part. This is termed metastasis of the inflammation. Thus, in rheumatism, the inflammation of one joint being resolved, another joint is at the same time affected. In gonorrhœa, inflammation of the testis sometimes suddenly occurs upon the cessation of the discharge.

Effusion.—One of the earliest of the phenomena of inflammation is the effusion of a fluid resembling liquor sanguinis. The watery portion of this effusion is in most cases removed by absorption, leaving a pale, soft, grayish, solid residuum, which seems identical with the fibrin of the blood. This is known as "*coagulable lymph.*" It must be viewed as a foreign body, the removal of which is essential to the restoration of the inflamed tissue to its healthy or normal condition. There are several modes in which this may be effected.

1*st.*—By development into some kind of tissue.

2*nd.*—By being re-absorbed and thrown off from the system.

3*rd.*—By undergoing a process of wasting or withering.

4*th*.—By being converted into pus.

Organization of lymph into tissue.—There is nothing more certain in pathology, than that the organization of lymph is due to its own inherent properties, but it nevertheless requires nearly all those conditions which are concerned in healthy nutrition. The kind of tissue into which it seems under all circumstances prone to be developed, is the fibrous or fibro-cellular, but it likewise manifests a tendency to be converted into a tissue similar to that near to which it may have been effused. Thus, in fractures of bones, the effused lymph is converted into osseous tissue, having previously passed through a stage of fibrous or cartilaginous development. There are two modes in which lymph may become organized :—1*st*, by its molecules arranging themselves in a linear direction so as to form minute filaments or fibrils; and 2*nd*, by the formation and transformation of cells.

If an exudation recently effused on the surface of a serous membrane is examined, it will be found to consist of minute fibrils, amongst which corpuscules are sparsely scattered. As development proceeds, the fibrils become more distinct, and vary from $\frac{1}{14000}$ to $\frac{1}{10000}$ of an inch in diameter. They are arranged in bundles, often interlace across one another, and at length assume the character of the filaments of fibrous tissue. At other times, as for example in the formation of a granulation, the molecules appear as granules, around which a cell wall is developed. The cells when fully formed do not seem to differ from lymph corpuscules. They assume various shapes, lanceolate, caudate, or spindle shaped, and becoming elongated and joined end to end, are transformed into fibres. These two modes of organization, although quite distinct, very generally co-exist in a given effusion. As development advances, new vessels enter the organizing material by a sort of out-growth from those already existing.

The tissue into which lymph is capable of being converted, is dependent for the most part upon its quality. When the fibrinous element preponderates (euplastic), it is transformed into delicate fibrous or areolar tissues. When this is less abundant (caco-plastic), organization is imperfectly effected, the resulting tissue being coarse, fibrous, or fibro-cartilaginous. Lastly, when the corpuscular element is in large proportion (a-plastic), tissue is not formed.

Euplastic lymph resembles the layer which forms the buffy coat of inflammatory blood. It is closely related to the quality of that fluid and to the activity of the inflammation, and is met with for the most part in acute inflammatory diseases affecting sthenic robust persons.

Caco-plastic lymph occurs when the blood is deteriorated; also in inflammations of low character, and especially when these conditions are combined. When they exist in a still greater degree the lymph is a-plastic.

But although the degree of plasticity of lymph may often be referred to certain forms of inflammation and certain states of the system, it must nevertheless be borne in mind, that many other circumstances are operative. Thus, the long continuance of the inflammation; its seat and the nature of its exciting cause; the amount of the effusion, and the kind of treatment adopted for its cure materially influence its organization.

Changes in the lymph, other than its conversion into organized tissue.—Under favourable circumstances, the lymph undergoes a process of softening or liquefaction, by which it is rendered fit to be re-absorbed. This may be the result of fatty degeneration. The exudation corpuscules become charged with minute, shining, black-edged particles (oil globules), and are converted into granule cells. After a time the cell wall is ruptured, and the granules are merely held together by a pellucid substance. More rarely the lymph wastes and shrivels, being changed into granules or into a horny substance, and into which, at a later period, calcareous matter or pigment may be deposited. In the majority of cases, however, it is converted into a yellowish white fluid, known as *pus, puriform fluid, or matter.*

Characters of pus.—Though subject to much variety, according to the nature and seat of the inflammation, and the constitution of the patient, pus presents during an attack of sthenic inflammation the following characters:—A yellowish white opaque fluid with a greenish tinge, of the consistence and appearance of cream, slightly glutinous or unctious to the touch, having scarcely any smell, a sweetish mawkish taste, and an alkaline re-action. It is rather heavier than water, its specific gravity being about 1030. This kind of pus is called healthy or laudable. When allowed to stand, it separates into a clear supernatant liquid, and a solid portion which sinks to the bottom of the vessel. The former resembles the serum of the blood, containing albumen, extractive and saline matters. The latter is made up of corpuscules, granules, and nuclei.

Pus corpuscules.—The corpuscules constitute by far the greater portion of the sediment. They are spherical in shape, about $\frac{1}{2000}$ of an inch in diameter, distinctly cellular, and contain a granulous substance and a compound or simple nucleus, which becomes more apparent upon the addition of acetic acid. They appear to be a modification of the exudation corpuscules. In their immature state they are transparent, but afterwards opaque from the deposit of fatty or oily matter within them. Mixed with the corpuscules are numerous granules, consisting of disintegrated exudation corpuscules, particles of fibrin, debris of decomposed tissue, &c. Pus cells do not always present the characters above given; they are sometimes irregular in their outline and without any distinct nucleus. In many cases they are charged with oil globules.

Theory of the formation of pus.—The precise mode in which pus is formed has not yet been determined. There being no pores in the vessels through which the corpuscules can pass, it is plain that it cannot be a secretion or separation from the blood, as was at one time supposed. Two views are at present entertained. According to one, it is formed in the exudation by the development of cells. According to the other, from germs which are furnished by the cells of the areolar or connective tissue. The latter doctrine, which was promulgated by Virchow, is founded upon the assumption that the corpuscules of areolar or connective tissue exist in every part of the frame, and that the irritation set up by the inflammatory process leads to excessive production from them of new cells and germs. It has not, however, been admitted, that the cells of the connective tissue are universally distributed, so that the subject remains to be further investigated.

Pyogenic membrane.—In most cases, when pus is formed in the substance of an organ or tissue, it is limited by a membrane, which results from the development of effused lymph. This has been called the pyogenic membrane, under the erroneous belief that pus is secreted by it. It is now known to take no part in the suppurative process. A collection of pus within a membrane as just described, is called an abscess. Sometimes, however, in weak and asthenic states, there is no such limiting membrane; the pus is then said to be infiltrated.

Varieties of pus.—When pus is mixed with blood, it is *sanious*; if thin and acrid, *ichorous*; containing flakes of lymph floating in it, *cheesy* or *curdy*. When the fluid part is absorbed, the residue is called *lardaceous* pus.

Phenomena attending the formation of pus.—When pus is about to form, the pain of the inflamed part is throbbing, and the part itself swollen and tense. The central portion begins to feel soft and fluctuating, and afterwards the skin becomes red and shining. In some cases, however, pain is absent, the feeling of softness and fluctuation being the first indication of suppuration having taken place. The constitutional symptoms of inflammation are also modified. The fever subsides somewhat, and a rigor is sometimes noticed. After suppuration has been established, it is not uncommon for the fever to assume a hectic character. This is, indeed, almost always the case when inflammatory suppuration occurs in an internal organ, such as the liver. Great but undue importance has been attached to the setting in of a rigor as indicating the commencement of suppuration. In tropical countries, where malarious influence is more or less operative, rigors are not uncommon at the commencement of each exacerbation of the sympathetic fever, whilst they are often absent when suppuration has taken place. Suppuration having occurred, the pus may be removed by absorption, the corpuscules having of course previously undergone some change. More frequently, the abscess increases in size, and the intervening tissues being destroyed or absorbed, its contents approach the surface or some external outlet through which they may be discharged. The process by which this is effected does not differ from ulceration, to be presently described. The pus having been discharged, a chasm or ulcer is left.

Causes of suppuration.—The causes of suppuration are the persistence and intensity of the inflammation; defect of vital force; exposure of the effused lymph to air; the nature of the inflamed tissue, and the specific nature of the inflammation.

Ulceration.—It often happens, especially when it affects the skin or a mucous membrane, that inflammation leads to destruction of a circumscribed portion of tissue, leaving a space or hole or chasm, which is called an ulcer. The process by which an ulcer is formed, is ulceration. A similar destruction of tissue has been already noticed (page 52) as occurring in the formation of an abscess. The dead or decomposing molecules are usually ejected along with the products of the inflammation.

Nature of the process.—Ulceration is to be viewed as the destruction or death of a portion of tissue, in consequence of its nutrition having ceased. This is mainly due to the stasis of the blood during the pre-existing congestion or inflammation. It is probable also, that undue activity on the part of the absorbent vessels may share in the process, there being at the same time a suspension in the deposit of new material. There are various modes in which ulceration may commence. It may begin as inflammation destroying the molecules of the tissue, in which case they are discharged and mixed with the exudations. When the inflammation is more intense, a portion of the tissue is destroyed "en masse," being converted into a slough, upon the separation of which an ulcer is left. This mode of formation of ulcers in the mucous membrane of the intestinal canal is common in dysentery. Not unfrequently, ulceration begins as a vesicle or pustule upon the skin or mucous membrane, or in the glandular structures which open upon the surface of the latter membranes. When deposits take place into the sub-mucous tissue, the nutrition of the membrane being cut off, ulceration is a common result.

When congestion has long existed, a very slight amount of inflammation is sufficient to cause ulceration; indeed, it may be stated generally, that this is so whenever the vitality of a part is lowered. This may happen from general weakness, loss of nervous influence, pressure, distance from the heart, the application of cold, and the like. Lastly, ulceration is common in certain states of the system, the scorbutic, scrofulous, &c.

The effects of ulceration are repaired by *granulation* and *cicatrization.*

Granulation.—The inflammation on the surface of the ulcer having been checked, and in the tissue immediately surrounding it reduced within the proper limits, the surface assumes a glazed appearance from the effusion of plastic lymph. Into this lymph new vessels are prolonged from those already existing. Fresh lymph is deposited often in the form of granules, which under the microscope are found to consist of exudation corpuscules heaped together without order. The cells nearest the surface are converted into pus, those more deeply seated into fibro-cellular tissue, and those near the edges into epithelial cells.

Cicatrization.—As the granulations approach the surface, the edges subside somewhat until they both become of the same level. A thin whitish blue pellicle is then stretched over the surface of the sore, and at the same time the ulcer itself contracts, so that the extent of surface is lessened. This contraction continues long after the healing process has been completed.

Mortification.—It sometimes happens as the result of inflammation or other causes, that tissue is destroyed or killed in portions which are visible to the naked eye. This is mortification, gangrene, or sphacelus. The dead part is called a slough, or if in bone, a sequestrum. It loses its natural appearance, and is converted into a dark-coloured, cold, insensible mass, from which a peculiarly disagreeable odour exhales. When the process of sloughing has ceased, the attachment of the dead to the living parts is marked by a distinct red-looking line, called the line of demarcation. This is nothing more than inflammation set up in the living parts, leading to the effusion of plastic matter, which limits the extension of the gangrene, precisely in the same manner as the cyst of a phlegmonous abscess circumscribes a collection of pus. By a process of ulceration, extending through the line of demarcation, the slough is ultimately separated and cast off from the living textures. The occurrence of mortification is attended with marked general derangement. When it is produced by injury in robust persons, the constitutional disturbance may approach somewhat to the ordinary type of inflammatory fever, but very generally, and always if it is extensive, there is a tendency to depression of the vital powers.

In weakly persons the fever is always typhoid or irritative. Mortification may arise from the absolute or relative intensity of the inflammation, or from some specific character of it. The inflammation may be so intense as to kill the part at once, notwithstanding that it may have been previously quite healthy. More often, however, a less severe degree of inflammation causes mortification in a part that from some cause or other has been weakened, just as under similar circumstances, less in degree, it will sometimes cause ulceration. Where the local weakness is considerable, a very slight amount of inflammation is sufficient to cause the death of the tissue. At the same time we must not lose sight of the fact, that the kind of tissue affected influences the result, some textures being more liable to gangrene than others; the areolar, for example, as compared with glandular tissue.

Modifications of inflammation.—The peculiarities of inflammation of particular tissues and organs will be considered as a part of Special Pathology; a few general observations will be here made with the view of avoiding repetition.

Areolar tissue.—Inflammation of areolar tissue is not in general attended with much pain. Suppuration and gangrene, and the formation of abscesses are common, and in unhealthy persons the pus is frequently infiltrated. Thickening and induration are amongst its results, as in cirrhosis of the liver.

Serous membranes.—When serous membranes are inflamed, the pain is acute and the heart's action depressed, as indicated by the small size of the pulse; but the chief peculiarity is the tendency to the effusion of plastic lymph, by which the two surfaces of the membrane become adherent. Ulceration and mortification are rare.

Fibrous tissues.—These tissues are not often inflamed, except in connection with constitutional states, as gout, rheumatism, and syphilis. It is to be noticed how rarely the inflammation under these circumstances leads to suppuration or gangrene.

Skin.—Simple inflammation of the skin produces redness, which disappears under pressure, to return when the pressure is removed. In mild cases the cuticle desquamates; when more severe, a fluid, clear, turbid, or sanious is deposited beneath the cuticle, and being charged with exudation corpuscules, is readily converted into pus. If the inflammation should be intense, flakes of lymph, more or less adherent to the surface of the true skin (corium) are met with. They are said never to become organized. Suppuration, ulceration, and gangrene are common in inflammation of the skin. The inflammation may be limited to any one of the structures that compose the cutaneous texture, viz., the sebaceous follicles, the corium, &c., or the whole may be involved. As a general rule, unless erysipelatous, the inflammation does not show any tendency to spread. Inflammations of a specific nature are more frequent in this than in any other texture. They are often present in febrile states, and especially in those fevers which are of a contagious nature.

Mucous membranes.—Whilst in inflammation of serous membranes the lymph is plastic, it is very generally a-plastic in inflammation of mucous membranes, being almost always converted into pus. Inflammations of mucous membranes are of much importance in tropical countries, a large mortality being due to those of the intestinal canal. As in the cutaneous texture, the inflammation may be limited to one or more of the constituent structures. The more obvious results of inflammation of mucous membranes are redness in streaks or patches; thickening from deposits into the membrane itself, or the submucous texture; roughness of the surface from deposits of lymph in the form of granules; softening, induration, ulceration, and gangrene. The secretion undergoes considerable change. At first it is diminished, and the membrane is in consequence preternaturally dry; afterwards it is increased in quantity, being at first thin and somewhat acrid, subsequently opaque and puriform. Under the miscroscope it is found to contain exudation and pus globules, effete and incompletely formed epithelial cells. In certain states of the blood, inflammation of a mucous membrane leads to the deposit of a fibrinous or albumino-fibrinous mass upon the surface of the membrane. This has been most frequently seen in the air passages, but occasionally also in the intestinal canal. It does not seem to be connected with the intensity of the inflammation. These effusions are never, it is believed, organized into tissue; they may be converted into pus, or separating from the adjacent surface of the membrane, discharged either entire or in fragments.

VARIETIES OF INFLAMMATION.

Inflammation presents many differences, depending upon its duration and severity, the condition of the patient, and the nature of the exciting cause. When inflammation has been of short duration, the local and constitutional symptoms being well marked, it is said to be *acute;* when less severe, and with but little constitutional disturbance, *sub-acute;* and when very slow in its progress, with no marked febrile excitement, *chronic.* These various forms pass by gradual transition into one another, and, consequently, it is not always practicable to determine in a given case where the one ends and the other begins.

Chronic inflammation is often described as the sequela or result of an acute attack. More frequently, however, it is unpreceded by acute symptoms; in many cases, indeed, it precedes an acute attack. Chronic inflammation is for the most part connected with some more general derangement, and is therefore less amenable to treatment than the acute form. It is probable that chronic inflammation is used in too wide a sense. It should not be applied to those lesions, *i. e.* ulceration, thickening, &c., which are simply the consequence of acute inflammation, nor to many changes which are of a degenerative nature.

Sthenic inflammation is that which occurs in persons whose vessels are well filled with blood abounding in red corpuscules, the tonicity of the muscular tissue being rather in excess than deficient, and the blood vigorously circulated and the nutritive functions active. The sympathetic fever is marked by pungent heat of skin and a full and hard pulse. The products of the inflammation are plastic, and often removed by absorption or organized into tissue. This form of inflammation is not of common occurrence in tropical climates, and is restricted to those persons who have newly arrived from a more temperate region.

Asthenic inflammation is much more often met with. It occurs in persons the tone of whose vascular system has been from some cause or other reduced, and whose blood is deficient in red corpuscules. The effusions are less plastic than in the sthenic form, and antiphlogistic treatment is not in general well borne.

Between the extremes of sthenic and asthenic inflammation, there are numerous intermediate shades of difference requiring the exercise of much judgment in their discrimination, and which can only be acquired by careful and systematic clinical study of disease. It has been supposed, that of late years a tendency has been exhibited by most inflammatory diseases to assume an asthenic form, but it does not appear that this supposition is supported by any satisfactory evidence. It is true, that antiphlogistic treatment is less employed in the treatment of inflammation than it formerly was, but this is rather due to change of doctrine than to change of type.

A variety of asthenic inflammation is called *scrofulous*. It commonly affects the lymphatic glands in persons who are of a scrofulous or strumous habit. Another variety, in which blood is poured out and mixed with the inflammatory effusions, is termed *hæmorrhagic*.

When inflammation occurs in a person of good constitution, the effusions have a tendency to limit or circumscribe themselves. Such inflammation is *phlegmonous*. On the other hand, in unhealthy states of the system, and more particularly when due to the introduction of certain poisons, its tendency is to spread without limit. This is *erysipelatous* or *erythematic* inflammation.

Inflammation is called *specific* when it appears to depend upon a specific poison or materies morbi in the blood; gouty, rheumatic, and syphilitic inflammations may be mentioned as examples.

Causes of inflammation.—The causes of inflammation are predisposing and exciting.

Predisposing causes.—Amongst predisposing causes are—

1*st.*—All those circumstances which produce an anæmic state of the system or general weakness, as food defective in quality or quantity, impure air, long residence in a hot climate, diseases which interfere with depuration, malarious influence, fatigue, hard labour, exhaustive diseases, intemperance.

2nd.—Hereditary predispositions, as the scrofulous diathesis, hereditary weakness or debility. *3rd.*—Circumstances which produce local weakness, as cold, loss of nervous influence, previous attacks of inflammation, obstruction to the circulation of the blood, local congestions.

Exciting causes.—The exciting causes are—

1*st.*—Everything, which tears, bruises, and destroys the textures or acts chemically upon them, as wounds and injuries, and chemical agents. *2nd.*—Matters which mechanically irritate, as—(*a*) foreign bodies introduced from without, bullets, stones, splinters; (*b*) foreign bodies generated within, calculi, deposits from the blood (tubercle), or the blood itself (coagula); (*c*) effusions into abnormal situations of some of the natural excretions, as of the urine or contents of the intestinal canal. *3rd.*—Noxious matters in the blood, as—(*a*) poisons introduced from without, contagious influences, malaria, &c., (*b*) poisons generated within, retained excretions. *4th.*—Altered states of the blood. *5th.*—Alternations of temperature. *6th.*—Unhealthy occupations.

Principles of treatment in inflammation.—In the treatment of inflammation, the general principles to be kept in view may be briefly stated as follows:—

1.—To remove if possible the exciting cause.

2.—To place the patient in such circumstances as that the inflamed part and the system generally may be protected from all sources of irritation.

3.—To diminish when excessive, to excite when defective, the action of the heart.

4.—To diminish local congestion and determination.

5.—To prevent further effusion, and to promote the absorption or organization of the exudations, and where this cannot be effected, to facilitate their discharge.

6.—To restore the tonicity of the coats of the vessels.

7.—To remedy the effects of inflammation.

It may happen, that the removal of the cause is equivalent to the cure of the inflammation; as, for example, in the removal of a thorn from the flesh, or of a calculus from the bladder. More often, however, the exciting cause has led to changes which time and treatment can alone remove. Further, it may happen that such derangement has been produced as to render recovery impossible. In many instances the exciting cause is transient in its action, and has ceased to be operative before the patient is submitted to treatment. But although in some instances the removal of the cause does not actually remove the disease, yet in all cases it lessens its severity, and not unfrequently determines the result. It should, therefore, in all cases be carefully sought for.

The inflamed part must be protected from all sources of excitement. If an extremity, it should be kept at rest; if an internal organ, it should be, so far as is practicable, protected from everything which may be calculated unduly to excite its function. Thus, if the eye is inflamed, the light of the room should be lessened; if the intestinal canal, the peristaltic action of the intestines must be diminished; and if the respiratory organs, the quantity of blood which is brought to them for aeration.

It is not, however, sufficient to maintain the inflamed part in a state of rest. In inflammations of important organs, all animal functions must be controlled. Muscular movements should be prohibited, and the patient restricted to the recumbent posture; he should be excluded from all that is calculated to excite impressions, whether upon the organs of sense or of the mind, as sound, light, exciting conversation, and the like; or, in other words, he should be confined to bed in a darkened but well-ventilated room, from which loud noises are excluded, as well as gossiping friends and acquaintances.

The next indication is to regulate the general circulation. When vascular excitement is present it must be subdued. In sthenic persons, in the early progress of the disease, the sympathetic fever being of the acute inflammatory type, this is best effected by strict abstinence from food, and the abstraction of blood from a vein at the bend of the arm. In persons who are not sthenic, in whom the attendant fever is not characterised by a hard and full pulse, a sufficient impression may be made upon the action of the heart by the abstraction of blood from the inflamed part. In those who are still more asthenic, as indicated by a pulse of small volume and easily compressible, no blood should be drawn with the view of diminishing the heart's action, but this object should be attained by the use of sedatives and eliminants.

When inflammation occurs in persons who are very asthenic, it is often from the first accompanied by depression rather than excitement of the vascular system, whilst the nervous system participates in an unusual degree in the derangement. In such cases the heart's action must rather be supported than depressed, and the functions of the nervous system controlled by the use of sedatives, of which opium is the best.

In cases where blood-letting has been practised, it is often in the highest degree necessary to keep down the action of the heart by depressants, such as antimony; and in more asthenic cases where blood-letting is inadmissable, these remedies are not unfrequently required.

Whatever may be the constitution of the patient, the free abstraction of blood can only be proper during the first few days of the disease.

The local vascular excitement may be controlled by the withdrawal of blood and by the application of cold. It should be observed, however, that cold cannot be made to influence inflammations of many internal organs; but where its effects can be produced, it is a most potent remedy. Local blood-letting is chiefly serviceable in the way of derivation; by emptying vessels at some little distance from those which are concerned in the inflammation, the blood which is being determined to the latter is in part withdrawn and directed to supply the place of that which has been abstracted. With the same object, inflammation is sometimes excited in a healthy part, in the expectation that the determination of blood thereby induced will derive from the seat of the inflammation. It is probable also, that certain irritations may exercise an influence on the inflamed part through the nervous system.

The removal of exudations, and the prevention of further deposition of them, are important indications in the treatment of inflammation. Doubtless these are fulfilled by all the measures which are adopted for the restoration of the capillary circulation to its healthy condition; but there is one remedy in particular which has been considered to have a special influence in effecting this object, viz. mercury. It should be given in divided doses at short intervals and continued until the system is brought under its influence, as induced by a tender state of the gums and a moderate degree of salivation.

It must be distinctly understood, that all inflammations are not benefited by mercury, nor even the same inflammation at all times and under all circumstances. Without entering into details which will form the subject of a future chapter, it may be here stated, that mercury is best suited to inflammation of serous membranes; that it is of doubtful efficacy in inflammation of mucous membranes, and that it is injurious in all inflammations which occur in asthenic or cachectic persons. And, lastly, that in those forms of cachexia which seem to be related to scrofula, disease of the spleen and the kidney, its action is in the highest degree prejudicial. It has been stated that mercury is more useful in the diseases of tropical than in those of temperate climates. There appears to be no ground for this statement derived from experience, and all reasoning is opposed to it. As regards the natives of the country and Europeans who have been long resident, the opposite of this is nearer the truth.

After inflammation has been subdued, the vessels sometimes remain dilated from loss of tonicity of the coats. Frictions, pressure, stimulants, a suitable diet, and remedies of a tonic nature are here indicated.

Chapters 5. 6. 7 are ~~good, especially the~~ last on derangements of nutrition / structural changes — also Section II on Etiology — (M)

CHAPTER V.

DISEASED STATES OF THE BLOOD.

PYŒMIA.—*Systemic infection. Pyogenic fever.*—These designations have been used to signify an adynamic form of fever which is usually accompanied by the formation of abscesses, either in external parts, the large serous cavities, or the substance of internal organs. Although pyœmia has been chiefly studied in temperate climates, there is no ground for supposing it to be uncommon in tropical countries.

Symptoms.—The general symptoms vary in degree. In severe cases they are those of the lowest form of adynamic or typhoid fever, viz. a dry brown tongue, sordes about the teeth, a frequent, small, and easily compressible pulse, and low muttering delirium, often passing into stupor and coma. In milder cases the fever does not at first differ from ordinary remittent, but as the disease advances, it shows a tendency to become adynamic. In this less severe form its duration may be very considerable, with periods of progressive improvement, but sooner or later the symptoms return. It is probable that, in the great majority of cases, the termination is fatal, although several months may have elapsed from the commencement of the attack.

Purulent collections.—At a variable period after the accession of the fever, local symptoms of inflammation set in, and external fluctuating swellings in the areolar tissue or joints, preceded or not by the signs of inflammation, are common. These abscesses may be single or numerous, and after death one or many may be found in one or in several of the internal organs or serous cavities. The abscesses point, burst, and the pus is discharged ; and it is a remarkable fact, which has on several occasions been brought to my notice by my able colleague Dr. Ballingall, that no further suppuration takes place ; the opening remains patent, its edges are dry, and there is little or no discharge.

Mode of formation of secondary abscesses.—It was at one time supposed, that the pus in these abscesses is a deposit from the blood, but this is not possible. It was also believed, that a globule of pus in the blood obstructed a capillary vessel and excited inflammation. This view was thought to have been strengthened by an experiment made by a French pathologist, who injected quicksilver into the portal veins, and afterwards found that there were numerous abscesses in the liver, in the centre of each of which there was a globule of the metal. Putting on one side the want of resemblance between a globule of quicksilver and a pus corpuscule, recent observations have satisfactorily shown, that at the commencement of the formation of these abscesses there is no pus. In the first instance, it would appear that there "is a local and circumscribed capillary injection," in the centre of which a yellow spot subsequently appears, which is a drop of pus. The researches of the great

German Pathologist Virchow, leave little doubt that these abscesses have what may be called *a mechanical* origin, though the obstructive material is not pus. He ascribes them to the breaking up of coagula in the veins, particles of which mixing with the current of the blood, become obstructed in the capillary vessels.

Pathology.—Pyœmia has generally been considered to depend immediately on the presence of pus in the blood, but it is probable that other animal poisons of a septic nature may have a similar action to pus. It is believed that pus may mix with the blood, by being formed within the vessels, either as the result of inflammation of the veins (Phlebitis), or from change in the fibrin of the blood, or by being introduced into them from without. The fact of pyœmia being often met with in cases where suppuration is actually going on, led to the belief that pus is absorbed into the blood. It is clear, however, that the pus corpuscules cannot be absorbed, and therefore if pus in its integrity should enter from without, it can only be through an opening in a blood vessel. The absorption of the liquor puris, which not unfrequently happens from an abscess, without any sign of derangement, may be considered as an argument against the doctrine of systemic infection from purulent absorption; but it must be remembered, that the process of absorption in such instances is extremely gradual, and in all probability the absorbed matter is eliminated as fast as it is received into the vessels.

The injection of pus into the veins of animals produces death under symptoms similar to those of pyœmia, but it seems impossible to demonstrate its presence in the blood, partly because the corpuscules undergo an almost immediate change, and partly because, if they did remain unaltered, they could not be distinguished from the white corpuscules.

Whilst, therefore, there would appear reason to believe that secondary abscesses may be due to the presence of pus, recent observations have established the fact, that the presence of pus is not the sole cause. They have been met with in cases where there was no reason to suppose pus existed. It would appear, that in certain states of the system, under a very slight exciting cause, there is a tendency for coagula to form in the veins. These after a time soften down and become disintegrated, and portions circulating along with the blood, mechanically obstruct the capillary vessels. That the presence in the blood of unhealthy pus favours such coagulation cannot be doubted, at the same time it seems equally certain that other animal poisons have a similar action when introduced into that fluid.

Causes.—The predisposing causes are exhausting diseases, the shock of a surgical operation, the parturient state, unhealthy occupations, privations, intemperance, &c.

The exciting causes have been already noticed under Pathology.

LEUCO-CYTHÆMIA.—Within the last few years it has been ascertained, that the blood is occasionally charged with white-looking corpuscles, not apparently differing, except in size, from the white corpuscules of the blood. The red corpuscules would appear to be diminished. The spleen, liver, and sometimes the lymphatic glands are enlarged. Anæmia is always present, and hæmorrhages and dropsies are not uncommon; fever is generally absent, and there is no ground for connecting this condition with malarious influence. Leukhæmia, *white blood*, Leuco-cythæmia, *white cell blood*, have been used to designate this disease, the nature and cause of which are unknown.

Other conditions of the blood.—Many local diseases, both acute and chronic, are due to changes which primarily take place in the blood, but of the exact nature of which our knowledge is as yet too imperfect to permit of any systematic or comprehensive description of them. To one of these "blood crases," as they have been called, we trace the deposit of a peculiar substance called tubercle, which has such important pathological relations, as to require special consideration.

TUBERCLE.—Tubercle consists for the most part of small spherical masses of protein material, which is peculiar, in being incapable of any but the lowest form of organization. It is met with in many situations, but most frequently in the lungs of adults and upon the serous membranes of children.

Varieties of tubercle.—There are two varieties of tubercle, the gray and the yellow. The former appears as minute particles of a grayish colour, and of about the size of a millet seed; the latter in somewhat larger masses, of a yellowish white colour. The microscopic appearances of both are very similar, viz., oily-looking granules, nuclei, and a few imperfectly formed cells, held together by a homogeneous substance (or blastema). In the yellow tubercle the granular matter is the most abundant.

The relation which the two forms bear to one another is not yet determined. By some it is thought that they are quite distinct, by others that the gray is merely the earlier condition of the yellow. It is certain, however, that softening (to be presently described) does not take place in gray tubercle.

Tubercle must, in the first instance, be deposited in a fluid state, but it soon becomes solid. The spherical shape which the masses assume seems to be due to enlargement taking place by successive additions to their external surface. The deposit is into the substance of the tissue, and sometimes, in place of being circumscribed, is more or less infiltrated in the form of irregular masses, as in the lungs, or of flattened particles, as upon the serous membranes. There is reason to doubt, if tubercular matter is ever generally infiltrated throughout the substance of an organ, as for example, through one or more lobes of the lung. In instances where this has been thought to have occurred, it is probable that the matter infiltrated was pus, the fluid part of which had been absorbed. The rapidity of the accumulation of tubercular matter varies. As a general rule the process is slow, but sometimes very rapid, and it is then intimately connected with inflammation, either at the time of the first effusion or subsequent increase. As regards situation, tubercle is out of all proportion most common in the lungs and lymphatic glands; in other parts it occurs in somewhat the following order:—larynx, serous membranes, brain, spleen, kidneys, liver, bones, and periosteum. It should be observed, however, that as a primary deposit it is very rare in any organ but the lungs and lymphatic glands, and that when met with in other situations, it is secondary upon that in the organs just named.

Changes in tubercle.—Tubercle may remain for some time without change, or if there is change it is very gradual. The changes to which it is subject are of two kinds, viz., *softening* and *cretification.*

Softening begins in the connecting material or stroma, which is converted into a thinish fluid charged with granules. The corpuscules and granular particles being thus set free, the tubercular mass softens down into a diffluent cheesy mass. The softening is not confined to the deposit. The surrounding tissues becoming inflamed also soften, and their debris, with exudation and pus corpuscules, are mixed with the softened tubercle.

Cretification consists in the deposit of calcareous particles, the animal matter being removed by absorption. The mass is thus changed into a sort of concretion, which, surrounded by indurated tissue, may remain permanently unaltered. In some cases it is believed that, without any process of softening, the tubercle may wither and be converted into a horny substance, causing little or no inconvenience.

It is said that tubercle has been occasionally deposited before birth. Although not uncommon in childhood, it is by far the most frequently met with after puberty, and so constantly in the lungs, that it rarely or ever exists in other parts after the fifteenth year of age, without being also present in those organs.

Scrofulous diathesis.—There are certain general characters or appearances in an individual, by which the probability of the deposit of tubercular matter can sometimes be foretold. Persons in whom these characters are present, are said to be of the scrofulous or strumous diathesis. Besides being liable to tubercular depositions, they also suffer from chronic inflammation of the skin, lymphatic glands, joints, and bones, and many other disorders.

There are two varieties of the scrofulous diathesis.

1.—The complexion is fair, hair light, eyes blue or hazel, skin clear, lips thick, particularly the upper. The body is well developed, and there is a considerable deposit of subcutaneous fat, giving the form a rounded outline. The mind is active and often precocious.

2.—The complexion is dark and swarthy, the belly protuberant, the head misshapen from projection of the forehead, the fingers swollen and clubbed, and the intellect dull and sluggish. A less common variety might be mentioned, in which the hair is dark and the complexion of a dark olive. Amongst the dark races, the characters of the first or sanguine variety are not apparent, if we except the thick and tumid lip. Although tubercle is more common in persons of this, the scrofulous diathesis, than in others, it is by no means restricted to them.

Causes of the scrofulous and tubercular diatheses.—That state of the system in which tubercle is most frequently met with, may be either congenital or acquired. When one or both parents are scrofulous, their offspring are very liable to suffer from tubercular diseases. It has been often observed, that when both parents are tainted, and especially should there be blood-affinity between them, their children seldom escape. There is scarcely any disease which can be so frequently traced to hereditary descent, as that now under consideration; but as in the case of *all* hereditary diseases, a generation every now and then is passed over, the disease appearing in a third or in one even more remote from that first affected. It does not seem necessary, however, that parents should actually suffer from scrofula or tubercle, in order that the diathesis may descend to their progeny. Impaired health on the part of one or both, weakness from age, or the cachexia from other diathetic diseases, such as syphilis, will, in many instances, be sufficient to produce it.

Notwithstanding that the tubercular diathesis is so often hereditary or congenital, it may be acquired. Many of the circumstances under which this may happen have been well ascertained, others are still obscure. The healthiest person may acquire it by being ill-fed, living in over-crowded and ill-ventilated and ill-lighted houses, habitually breathing an impure atmosphere, or by being obliged to undergo excessive labour, or deprived of sufficient exercise; in short, whenever placed in circumstances which interfere with nutrition and assimilation. And these circumstances will be in a special degree operative, should they be brought to bear upon persons who are depressed by care, grief, or anxiety of mind. The effect of climate in favouring or impeding the development of the tubercular diathesis, requires further investigation. No one will deny, that tubercular diseases are more common in cold than in hot countries; but it does not follow that the diathesis is related to the difference of climate. It may be rather that cold calls the diathesis into activity, and determines the tubercular deposit to particular organs; thus acting as an exciting cause where the predisposition already exists. It is often noticed that natives of tropical countries suffer from tubercular diseases after living for a short time in a cold climate; not, it is believed, because a tubercular diathesis is developed, but more probably because, having been already present, the cold excites it to activity.

There is no doubt that cold and wet, and sudden alterations of temperature, are amongst the most efficient exciting causes of tubercular diseases, and it is quite possible, that persons who are protected from these influences may, even when the diathesis is established, pass through life without suffering from tubercular disease. On the other hand, the diathesis may be so strongly developed, that disease manifests itself independently of the action of any of the ordinary exciting causes.

That scrofulous and tubercular diseases in tropical countries bear no kind of proportion, as regards the frequency of their occurrence, to the same diseases in temperate climates, is well known. This is strikingly evident in the comparative rarity of scrofulous diseases of the joints, and of the more common tubercular diseases of childhood. Phthisis is not, however, a rare disease either amongst Europeans living in, or the Natives of, tropical countries; but there are not sufficient data to warrant a comparison as to its relative frequency in tropical and temperate climates. Although not a rare disease, there seems good reason for believing that it is less frequently called into existence in predisposed persons, than in countries where the changes of temperature are more sudden and considerable than they are in tropical regions. It is not uncommon to see young persons arrive in India with well-marked characters of the tubercular diathesis, who for many years are free from actual disease. How far this may be due to mere change of temperature cannot be determined. But it is certain, that the more free exposure to the air, which the warmth of the climate permits and renders necessary, does much to delay the occurrence of disease. It must not, however, be forgotten, that when tubercular disease has actually occurred, it runs its course towards an unfavorable termination with greater rapidity in a tropical than in a temperate climate.

Treatment of the tubercular diathesis.—1. To improve the general health and the depraved condition of the blood. If the causes of the altered condition of the blood can be ascertained, they should if possible be removed. The patient should be well fed, housed, and clothed, and made to take free exercise in the open air. Any derangement of the digestive organs that may be present should be rectified, and the state of the excretions carefully attended to. The food should contain a lange proportion of protein constituents, and should be adapted in quantity to the patient's power of digestion. A tonic regimen and tonic medicines, sea air, or even a sea voyage are often serviceable.

2. To guard against irregular distributions of blood, and to remove them when they have occurred. Nothing is probably more effectual in preventing local congestions and determinations of blood, than the maintenance of a state of vigorous health. Much in addition may be effected by attention to clothing and protection from sudden changes of temperature.

3. To remove the tubercular deposition. The means to be adopted with this object will be considered in Special Pathology.

CHAPTER VI.

IDIOPATHIC FEVER.

Idiopathic is distinguished from sympathetic fever, already described (page 45), by not being dependent upon local inflammation. This, it is true, may be and often is present, but it is not the cause of the fever, and very generally indeed occurs subsequently to its commencement, as a consequence of that derangement of the circulation which is the necessary accompaniment of the febrile state. The prominent symptoms of fever or pyrexia have been stated (page 46). The only one of them, however, which is constant, is increase of temperature, and which may be ascertained by the thermometer, even when the surface appears cold and the patient is shivering.

The symptoms of particular fevers will be hereafter fully described; a few general remarks may now be made.

Almost all fevers have a premonitory stage or stage of incubation, and this, although of variable duration in different fevers, is often remarkably constant in the same fever. During this incubative stage, slight functional derangements may be noticed without being sufficiently characteristic to mark the nature of the attack. The attack itself very generally sets in with a feeling of chilliness or shivering, which is followed by what may be called the essential symptoms of the febrile state, viz., heat of the skin, thirst, a frequent pulse, and scanty and high-coloured urine. After a variable period, these symptoms subside wholly or in part, and the skin becomes moist or covered with profuse perspiration. In some forms of fever, the symptoms recur, and often with increased violence.

Pathology of fever.—Notwithstanding the attention that has been given to the subject, the pathology of fever is as yet but imperfectly understood. We know that increased decomposition or disintegration of tissue is constant in fever, and it is more than probable that the elevation of temperature is due to this alone. The cause of the increased tissue change is to be sought for in the nervous system, and not, as was formerly supposed, solely in some change in the properties of the blood. It is believed that the poison of fever, having been received into the blood, acts upon the nervous centres, and that in consequence of the changes or derangement thereby induced, the symptoms of fever are evolved. It is probable, however, that the blood does undergo some change, and this may, indeed, precede the nervous derangement. What the nature of that change is, or whether the nervous system is influenced by it, or more directly by the poison, is unknown. The derangement of the nervous system above referred to, appears to be a suspension of what has been called its moderating power over the disintegration of tissue.

Fevers are liable to be complicated with various local congestions and inflammations, but in some instances they run their whole course without any evidence of such complication. When in the latter case they terminate fatally, death is usually in the way of syncope and asthenia. It is to be observed, that when local affections *do* occur in fever, the symptoms are less marked than when the inflammation is primary.

Varieties of fever.—As already stated, there are two classes of fever, the *sympathetic* and the *idiopathic*. The forms of sympathetic fever, the sthenic, asthenic, and hectic, have been already described (page 45, *et seq.*).

The varieties of idiopathic fever are the *continued* and the *remittent*. The *continued* fevers comprise the ephemeral and specific.

Ephemeral fevers.—Ephemeral fever is produced by the ordinary causes of disease, such as alternations of temperature, errors in diet, and the like. It may last from a few hours to several days; it is unattended with danger, and requires but little treatment.

Specific fevers.—The specific fevers are those which are occasioned by certain specific causes, as heat, exhalations from decomposing organic matter, and contagion. The fevers thus produced are—1, the ardent continued of tropical climates; 2, typhoid; 3, typhus and relapsing; 4, the erruptive fevers or exanthemata, *i. e.* small-pox, measles, scarlet fevers, &c.

The *remittent* fevers are for the most part caused by the reception into the system of a poison called malaria. They differ from the continued in this, that at some time or other during the 24 hours, the symptoms either subside or altogether disappear, to return if not checked by appropriate treatment with equal or greater severity. Of the nature of the poison to which these fevers are due we know but little. It is believed to be generated by the action of heat and moisture upon the surface of the earth, and hence such fevers are most common in tropical countries.

It is not uncommon to distinguish forms of fever according to the predominance of certain symptoms. Thus, when the attack sets in with coldness of the surface, a feeble pulse, and an appearance of collapse, the fever is called *congestive*. When the skin is hot and pungent, the pulse full and hard, it is said to be *inflammatory*, and when there are marked adynamic symptoms, as a brown dry tongue, low muttering delirium, and a very feeble and frequent pulse, it is designated *typhoid*.

CHAPTER VII.

DERANGEMENTS OF NUTRITION AND TEXTURAL CHANGES.

The nutrition of a texture may be increased, diminished, or perverted.

Increased nutrition—Hypertrophy.—Hypertrophy must be distinguished from mere enlargement, which often occurs without increase of nutrition, as in the distension of a hollow organ by gas, blood, and other fluids, or the swelling of a solid organ by congestion or abnormal deposit. On the other hand, there may be hypertrophy and yet no enlargement—this happens when the density of an open tissue is increased, or the walls of cavities, being thickened, encroach upon the interior. Hypertrophy is well seen in the increased development of a muscle under exercise, as in the biceps of persons who are engaged in such occupations as require constant and laborious exercise of the arms. The muscular tissue is actually added to, the fibres being larger and more numerous. Examples of hypertrophy are also met with in the walls of hollow muscular organs, whenever there is impediment to the passage of their contents, as in the left ventricle of the heart in disease of the aortic valves, or in the bladder in stricture of the urethra. Sometimes hypertrophy is compensatory; one kidney being destroyed or absent, the other becomes hypertrophied. Hypertrophy can hardly be viewed as a disease, but it is often the result of disease, and sometimes the cause of it. Of the first, thickening of the walls of the heart from valvular disease is an example; of the last, the pressure of a hypertrophied thyroid body upon the neighbouring structures. For the most part, however, hypertrophy is to be considered as conservative. It is most common in the muscular, glandular, and adipose tissues, and in certain of the ductless glands, as the thyroid. Hypertrophied parts or organs may remain for long unchanged, but they are predisposed to fatty degeneration.

Causes.—Undue functional activity, leading to increased accumulation in the local blood supply of those materials which the organ appropriates for its nutrition or secretion.

Hypertrophy of the adipose tissue.—This is of common occurrence in certain situations in advanced life, and is then scarcely disease. Sometimes, however, at all ages, a circumscribed portion of fatty tissue becomes greatly hypertrophied, giving rise to a fatty tumor. In other instances, the whole or a large part is inordinately increased. This can sometimes be traced to habits of life, but more frequently to some predisposition which is often hereditary. Whenever there is great corpulency, all the functions are impeded; the heart is oppressed by the weight it has to carry, hence the blood is imperfectly circulated; the respiration becomes disturbed, and subsequently the nervous system, as evidenced by sluggishness and apathy of the mental faculties.

Obesity is very common in the higher classes of the Parsee community of Bombay, and especially in females. Besides the inconvenience which results from unwieldiness, there can be no doubt that the pressure of fat often induces atrophy or wasting of important organs, and thus becomes a cause of early death. When the predisposition is not very great, well-regulated exercise, and a diet sparingly supplied with fatty and saccharine matters, will often be sufficient to prevent excessive corpulency. In states of greater predisposition more is required; indeed, nothing will in some cases be effectual. In young or middle-aged persons, a rigid system of training may be had recourse to, provided that the patient can be induced to follow it; but I have never known any native of India who would. In old persons this is of course out of the question.

Defective nutrition—Atrophy.—Atrophy is the opposite of hypertrophy; and just as the latter is caused by excessive functional activity, so is the former by deficient functional activity. When limbs are not used, as in paralysis, all the structures waste and become atrophied. Atrophy also occurs when the supply of blood is cut off or diminished, or when a part is long pressed upon. It likewise arises from the deposit of fatty matter, in place of the normal tissue; wasting of muscular tissue is often thus induced.

PERVERSIONS OF NUTRITION.

Morbid growths.—Among perversions of nutrition, those leading to the development of what have been called morbid growths, demand special attention. Morbid growths may be considered as of two kinds:—

1. As more or less resembling the normal tissues (though abnormal from their extent and situation), and of an innocent or non-malignant nature.

2. As differing from the normal tissues and malignant in their nature.*

Non-malignant growths.—A non-malignant growth may be defined to be that which does not show any tendency to destroy and take the place of the parts in its neighbourhood, and which, if entirely removed, does not recur either in the same or in any other part. Tumors of an innocent nature are comprised under this heading, and being more frequently external than internal, are usually treated of in works on Surgery, to which the student is referred.

Malignant growths—Cancer. Carcinoma.—Malignant growths in most instances differ in structure from the normal tissues; they extend themselves with more or less rapidity, destroy and substitute themselves for the parts in their neighbourhood, and in most instances involve the nearest lymphatic glands. If removed, they almost always return, either in the same or in some other part.

Cancer is used to designate a large proportion of malignant growths, which have for the most part a peculiar structure.

Structure of a cancerous tumor.—A cancerous tumor essentially consists of a semifluid blastema, irregularly divided into spaces or loculi by bands of fibrous tissue, of cells, and of a peculiar fluid called the cancer juice. The quantity of fibrous tissue is subject to much variety, and sometimes its existence can scarcely be traced. The cells which have nuclei and nucleoli, assume almost all shapes and sizes. Many are elongated and caudate, but they may be spherical or oval. In size also they vary much, but the greater number are large. Although it is certain that there is not a typical form of cell which is always present in maglignant disease, yet cells, varying in size from $\frac{1}{1200}$ to $\frac{1}{400}$ of an inch, having an elliptic nucleus and nucleoli, are often met with.* It must not at the same time be overlooked, that cells similar, if not identical with these, are sometimes present in umors which are of the most innocent kind. In judging of the nature of a tumor by microscopical examination, more weight should be given to the multitude, size, and more or less uniform character of the cells, than to their appearance and configuration. The cancer juice which may be made to exude from the cut surface of a cancerous tumor is a viscid, whitish, creamy fluid, and doubtless performs an important part in the development of the cancer cells. It is ascertained, that this fluid mixes with the parenchymatous fluid of the parts immediately adjacent, and gives to it the property of forming cells, which do not differ from cancer cells. In this way the disease propagates itself by a sort of infiltration. It is believed also, that by the absorption of this parenchymatous fluid, the whole system becomes contaminated, and thus cancerous growths occur in other situations. Besides the constituents of cancer above noticed, others are sometimes observed. Thus, pigment is found, giving rise to a black appearance (melanosis), and occasionally the fibrous bands are charged with calcareous matter.

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* This is not an accurate arrangement, as it is certain that tumors, apparently quite innocent, so far as structure is concerned, may occasionally present all the characters of malignant disease. Our knowledge of tumors is, however, too imperfect to permit of a purely scientific classification.

Situation of cancer.—There is probably no organ nor texture which is exempt from cancerous disease. It occurs, however, more frequently in some than in others. It is common in glands, in the genital organs and stomach. The intestinal canal, especially the large intestine, is often affected, as are also, but more rarely, the lungs, kidney, and brain. The liver is very subject to cancer, and certain forms of it are prone to attack the outlets of canals, as the lips, mouth, and the lower part of the rectum.

The *tissue* in which cancer is most often met with, is the areolar, and next to it the skin; but it occurs also, though much less frequently, in muscles and bones. Females are more liable to cancer than males, and this not only in the organs which are peculiar to the sex, but also in other situations. The uterus and mamma are very frequently affected.

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* The statement made by Dr. Walshe many years ago, is now fully confirmed, viz. a tumor may present to the naked eye the characters of encephaloid, be the seat of interstitial hæmorrhage, affect the communicating lymphatic glands, run in all respects the course of cancer, and nevertheless contain no cells but such as are undistinguishable, in the present state of our knowledge, from exudation cells.—*Cyclopædia of Anatomy.*

Progress.—The progress varies much in the different forms of cancer, and in the same form in different persons. Scirrhus is, as a general rule, slower than encephaloid, and all forms are less rapid in old than in young persons. But whatever the rate of progress, it is almost always continuous. Commencing at a point, cancer extends itself, at first perhaps by thickening and induration, afterwards by ulceration. A cancerous ulcer has usually thick and everted edges and an irregular surface, from which there is a copious fetid discharge. But these appearances are not characteristic, as they are sometimes present in venereal and scrofulous sores.

Cancerous cachexia.—Along with or before the occurrence of ulceration, there is more or less general derangement, which is sometimes so peculiar, as to have led to the designation "cancerous cachexia." In its highest degree, the face is pinched and sallow, and expressive of despondency and distress, the body ill nourished, and the digestion deranged; the pulse is more frequent than in health, and there is a tendency to febrile accessions. These symptoms keep pace with the advancing local disease or outrun it, until the patient sinks worn out by pain and want of rest. In many instances death can be readily explained by the extent of the local mischief; but in others it appears to be due more to the general derangement than to the local disease.

Pathology of cancer.—There has been much discussion as to whether cancer is primarily a local or general disease. It has been thought that, sometimes commencing as a local disease, the system becomes secondarily involved. The frequent co-existence of cancer in several situations, the cancerous cachexia, the little success that has attended the removal of cancerous disease by surgical operation, even in the earliest stage, render it almost certain that it is essentially a general and not a local disease.

VARIETIES OF CANCER.—There are three chief varieties of cancer, viz., *scirrhus*, *encephaloid*, and *colloid*.

Scirrhus.—Scirrhus is distinguished by its density and hardness, which are due to the predominance of fibrous tissue. The surface of a section has a bluish or grayish white appearance, and is traversed by numerous fibres. The cancerous juice is in very small quantity. The progress of scirrhus is in general slow and the tumor seldom larger than an orange. It involves the neighbouring parts, especially the skin, which becomes adherent to the surface, and shrunk or contracted. Scirrhus is most common in old persons, and is but rarely met with before puberty.

Encephaloid.—Medullary sarcoma. Fungus hæmatodes. Cerebriform disease.—Encephaloid, as contrasted with scirrhus, is remarkable for its softness, having an elastic or even fluctuating feeling. When cut into, it looks like the medullary nervous matter, and on this account has been called medullary sarcoma or cerebriform disease. It has a basis of fibrous tissue in small quantity, but is chiefly composed of cancer juice and large cells. It contains many blood vessels, the coats of which are thin and easily ruptured ; consequently blood is often poured out into the substance of the tumor, or externally should there be an abrasion or ulcer. When the latter is present, the cancerous substance protrudes in the form of a fungus, which bleeds on the least irritation, and hence the designation " fungus hæmatodes." The growth of encephaloid is much more rapid than that of scirrhus, and the tumor often attains a much larger size. There is scarcely a tissue that it does not attack, and it often exists in several at the same time. No age is exempt from it ; but it is most common in young persons, and may occur even in infants.

Colloid.—Colloid cancer consists of numerous fibrous bands, so arranged as to form spaces or loculi, in which there is a gelatinous fluid, charged with cancer cells. In some instances the gelatinous fluid does not contain cancer cells, but is structureless, or merely contains a few molecules. This has been called colloid tissue. Colloid cancer is mostly found in the pyloric end of the stomach, and seldom occurs in more than one organ at the same time.

Epithelial cancer.—There is a form of cancer which is always found in the mucous membranes or skin. It differs from other forms in its anatomical structure, and in not being attended with secondary cancerous formations in internal parts; but it exhibits the same tendency as true cancer to infiltrate and destroy the surrounding parts, and to cause death. It has been named epithelial cancer or epithelioma. In structure it is described as consisting for the most part of epithelial scales, not differing in shape or size from the ordinary epithelial cells, but arranged concentrically and closely packed so as to form masses or balls. Epithelioma most frequently attacks the muco-cutaneous tissue at the various outlets, and is fully described in works on Surgery.

Semi-malignant growths.—There are certain growths which in structure present the characters of innocent or non-malignant, and yet resemble the malignant in their more prominent and deadly characters. These have been termed semi-malignant. They are mostly fibrous or cartilaginous in structure.

FATTY DEGENERATION.—All tissues are liable to a degeneration in which fatty matter is deposited in place of the molecules of the tissue. Many are thus destroyed, and the most serious derangement produced. The fat is deposited for the most part in the form of granules. Of all tissues, none is more often affected with fatty degeneration than the muscular. The granules of fat are deposited within the sarcolemma; the transverse striæ disappear, and as the quantity of fat increases, the true or normal structure of the muscle is lost. It becomes paler and softer, and on pressure drops of oil may sometimes be made to exude. The cells of secreting organs are also very liable to this form of degeneration. The molecules of fat are said to appear first between the nucleus and cell wall, and afterwards increase until the cell is filled with them. The nucleus disappears and the cell often bursts. In this way the cells are destroyed and the secreting power of the organ lost. The coats of the blood vessels are often affected with fatty degeneration, the molecules being deposited between the coats along with crystals of cholesterine or even particles of calcareous matter. By these deposits the coats of the vessels are rendered brittle and easily ruptured.

Whilst all the normal tissues may undergo fatty degeneration, it not unfrequently occurs in the exudations which are the result of inflammation.*

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* Fibroid and calcareous degenerations, will be considered along with diseases of the organs and textures in which they most frequently occur.

PARASITES.

Although it cannot for a moment be maintained that parasites are produced by derangement of nutrition, yet there is every reason to believe that their development and propagation are favoured by those conditions to which imperfect nutrition leads. It is consequently not altogether out of place, and it is convenient, to consider them in this chapter.

It is well known, that all animals are liable to be infested by minute creatures, which are known as parasites or epizoa, as fleas, lice, bugs, &c. These, though sufficiently annoying and troublesome, do not in general cause so much inconvenience as to give rise to disease. But parasites are sometimes developed, which occasion great discomfort, or even serious derangement. They are derived from both the vegetable and animal kingdoms, and are met with upon or in the skin, the areolar tissue, the hollow viscera, or the substance of solid organs. The vegetable parasites, which belong to the cryptogamia, usually grow upon the skin and upon the surface of mucous membranes. In the former situation, special forms have been recognised as causes of particular skin diseases, as the *tricophyton tonsurans* in tinea tondens, the *achorion-schonleinii* in plica polonica.

The connection of vegetable formations upon the mucous membranes with disease, has not been sufficiently investigated, but there is reason to believe that they play an important part in the severe forms of diphtheria and scarlet fever. The subject of vegetable development in the human body has of late received increased importance by the valuable researches of my colleague Dr. H. V. Carter, who has conclusively shown, that a peculiar form of disease of the foot and hand, common in certain parts of India, is due to the development of a fungus in the substance or parenchyma of the organ.

The parasites in the human body, which belong to the animal kingdom, are very numerous. Some of them at least also exist in other animals, but in a different stage of development. The *cysticercus cellulosa,* found in the areolar tissue of certain animals, as the pig, sheep, or ox, is the immature tape-worm of the human subject, and the *cysticercus fasciolaris,* which exists in the liver of the mouse, a similar condition of the tape-worm of the cat.

The most important of the animal parasites in man, are the HELMINTHOID entozoa or worms. A large proportion of these are found in the intestinal canal, and are hence called *intestinal worms.* All the worms met with, may be classed as *cestoid* or tape-worms, *nematoid* or round worms, and *trematoid* or fluke-like worms.

Cestoidea or tape-worms.—The tape-worm in its mature state has its abode in the small intestines. It is flattened and of a whitish gray colour, and consists of joints or segments, in each of which are male and female reproductive organs and fecundated ova. There are two varieties of tape-worm, the *tænia solium* and *tænia lata;* the former is by far the most common, the latter being restricted for the most part to the inhabitants of certain countries.

Tænia solium.—The tænia solium is sometimes several yards in length, and has been known to reach through the whole of the intestinal canal. It has a minute hemispherical head, on which are placed four lateral suckers (oscula), within which is a double row of hooklets. The segments increase in breadth from the head to about the middle, and then diminish to the posterior extremity. At the margins of each segment is the opening of the generative canal. The broadest segment measures about three or four lines, the narrowest, which is near the head, about one-fourth of a line in width.

Tænia lata.—The tænia lata is chiefly met with in Russia and Sweden, and is there the common form of tape-worm, the tænia solium being rare. In France both forms occur. The segments are broader than they are long, and the openings of the generative canals are on the middle of the flat surface, in place of being at the margin. By these characters it may be distinguished from the tænia solium.

Development of tape-worm.—Until within the last few years, little was known of the origin or development of tape-worm. It is now, however, ascertained to be the mature state of an entozoon, which undergoes a part of its development in other animals. It appears that the fecundated ova of the tape-worm being received along with the food into the intestinal canal of a sheep, pig, or other animal, the wall of the egg bursts, and the embryo is set free. This consists of a vesicle, with six hooklets at one extremity. Being set free, it begins to migrate, in order to reach the place where it is to become encysted and undergo its further development. It effects its passage by piercing the textures with its hooklets, which are capable of being so arranged, as to form a sort of stiletto. In many instances it passes at once into the blood, and is by that fluid conveyed to the organ or tissue in which it is to take up its abode. In the case of the pig and some other animals, the areolar tissue is its favourite habitat, where it produces, in the former animal, that condition of pork which is known as "measly." Either before, during the journey, or soon after its arrival, it undergoes the second stage of development, which consists in the formation of a head with oscula and hooklets, similar to that of the mature tænia. The third stage of development takes place whilst it is encysted, and consists in the formation of segments. It is now in structure a tape-worm, with this important exception, that it is destitute of sexual organs. This is the highest stage of development which the animal can attain whilst encysted, and it is only in the intestinal canal that it can be completed by the formation of the sexual organs. In the state just described, it is called in the pig and some other animals the "cysticercus cellulosa." When these animals are used as food, it is easily conceivable how the cysticercus may reach the intestinal canal of man. Here its development is completed, and it becomes sexually perfect. Although the earlier stage of development is for the most part effected in an animal distinct from that in which it is completed, yet this is not invariably the case. There is reason to believe that, whilst in the intestinal canal of man, some of the ova escaping from a segment, may undergo the first stage of development. Then having become capable of migrating, the animals may make their way into the substance of some organ, as the liver, and there become encysted. This is believed to be the chief danger of the long continuance of tape-worm in the intestinal canal.

Considering the frequent occurrence of the earlier states of development of the tape-worm in animals often used for human food, it might be thought the entozoon would be more common than it is. It is probable, however, that the creatures are for the most part destroyed by cooking the food. In countries where meat is eaten raw (as in Abyssinia), tape-worm is extremely common.

Of the immature forms of tape-worm, two are sometimes found in man, viz., the cysticercus and echinococcus—the former in the muscles, the latter in the liver and other situations.

Prevalence of tape-worm in tropical countries.—Tape-worm in India is chiefly met with in Europeans, Parsees, Mussulmen, and those Hindoos who make use of animal food. In the Hindoos who abstain from flesh it is very rare, if it ever occurs. Amongst European soldiers it appears to be common.

Nematoid or round worms.—Eight kinds of round worms have been met with in man; three in the intestinal canal, the remainder in various parts or organs.

The intestinal round worms are the ascarides, tricocephalus dispar, and ancyclostomum duodenale.

Ascarides.—The ascarides are of two kinds, viz., ascaris lumbricoides and ascaris vermicularis. The ascaris lumbricoides is usually found in the small intestines, and is most common in children. It is round and pointed at each end, of a grayish red colour, and measuring from 6 to 15 inches in length. It is traversed on each side by two lines, corresponding to the principal vessels and nervous cords. The anterior extremity or head, which is the smaller of the two ends, is marked by three tubercles surrounding the mouth; at the opposite extremity, which terminates in a point, is the opening of the anus. The female may be distinguished from the male by the posterior extremity being straighter and thicker, and by a constriction at the junction of the anterior and middle thirds, in which the vulva is situated. Both sexes may be known from the common earth worm, by noticing that the extremities of the latter are less pointed, and that the mouth is at the under surface of the head.

The ascaris lumbricoides is very common in the inhabitants of Bombay, and often exists in great numbers, without apparently causing inconvenience. It is not uncommon in the advanced stages of exhausting diseases, to observe one or more creeping out of the mouth or nostrils, or mixed with vomited matters.

Ascaris vermicularis.—The ascaris vermicularis has its abode in the rectum, and is very common in children. It often causes great irritation, not only there, but also in other places in the neighbourhood into which it creeps. Its size is very inconsiderable, the female measuring not more than five, and the male two lines in length, and they are both proportionally slender; indeed, so slender, as to be often called thread worms.

Tricocephalus dispar.—The tricocephalus dispar is most frequently met with in the cœcum and colon, adhering to the mucous membrane. The anterior part, about two-thirds the length of the animal, is very slender, and terminates in a point, in which is situated the opening of the mouth. The posterior two-thirds is much thicker and arranged in a spiral form; it ends in a blunted extremity. The tricocephalus is said to be very common, and to be often overlooked, on account of its colour resembling that of the fæcal mass in which it is situated.

Ancyclostomum duodenale.—This entozoon is extremely frequent in Egypt, and is often the cause of repeated hæmorrhages. It is said also to occur in tropical countries generally, but I am not aware of the facts on which this statement is based. It is described as being about one-third to half an inch in length, and about the twentieth part of this in width. The head is provided with hooklets. It is found in great numbers between the valvulæ conniventes of the duodenum, and it is alleged that the chlorosis of the Egyptian climate is often the result of repeated and small hæmorrhages from the intestine, caused by this parasite.

Of the origin and development of round intestinal worms, nothing is known with certainty. There can be little doubt that they are in some way or other introduced from without. Considering their extraordinary prevalence in the vegetable feeders, it would seem probable that they are derived from the vegetable kingdom. Of the round worms not inhabiting the intestinal canal, the most important is the—

Filaria medinensis or Guinea Worm.—The guinea worm is developed in the areolar tissue; but sometimes also in the substance of glandular organs. It is from six inches to many feet in length, and from a half to two-thirds of a line in thickness. The body is round and thinner towards the anterior than the posterior extremity, which in the female is incurvated. The mouth is a puncture at the anterior extremity; the anal aperture is lateral and not at the posterior extremity.

The guinea worm is very common in certain localities, but does not exist in many parts of the world. It often remains for a long time without causing inconvenience, but sooner or later inflammation sets in, which ends in suppuration, by which the worm is discharged.

Mode of production of Guinea Worm.—The origin of guinea worm is not yet fully ascertained. There are many reasons for believing that it is introduced from without, and that it effects its entrance either through the skin or along with the food. The former channel is the more probable. It is thought that its earlier stage of development is represented by the common tank worm. Entering whilst in this condition through the orifice of a sudoriferous duct, it meets with a nidus suitable for its full development into the guinea worm, just as the cysticercus finds its nidus for development into the tape-worm in the intestinal canal. The tank worm is said to have nearly all the characters of the young guinea worm, except that it is of smaller size, measuring $\frac{1}{54}$ of an inch in length, and $\frac{1}{1900}$ of an inch in breadth, whilst the young guinea worm measures $\frac{1}{33}$ of an inch in length, and $\frac{1}{633}$ of an inch in breadth. This difference of size has been considered a fatal objection to the supposed relation between the tank and guinea worm, for it is said, that an animal which is smaller than the young of another animal, can hardly be the early stage of development of an animal of that species. But in stating this objection, due weight has not been given to the frequency of monstrous or abnormal developments, in connection with a favourable nidus.*

Filaria oculi is a minute worm sometimes met with in the human eye. It was first detected in the liquor morgagni. The eye of the horse is infested by a filaria of large size, but similar in structure to that just noticed, except that the mouth at the anterior extremity is surrounded by papillæ.

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* H. J. Carter, F.R.S., Transactions of Medical and Physical Society, No. II., page 45.

Trichina spiralis has been found for the most part in muscular tissue, lying between the ultimate fibres in contact with the sarcolemma, and enclosed in a transparent cyst. Its length is from the $\frac{1}{24}$ to $\frac{1}{30}$ of an inch.

Filaria bronchialis was discovered in an enlarged bronchial gland. It is about an inch long and very slender.

Strongylus gigas.—This is a creature of large size, which is developed in the parenchyma of the kidney. It is sometimes three feet long, and half an inch thick, and is of a dark-red colour. The strongylus is not confined to man, being found in the dog, wolf, and some other animals.

Trematoid entozoa.—The trematoid entozoa are very rare in the human subject. One species, the *distoma hepaticum*, is occasionally met with in the gall bladder or ducts of the liver, or in the intestinal canal or stomach, having escaped from the former situations. In the Museum of Grant College there are specimens of it, which were presented by Mr. Atmaran Pandurang. They were found in matters vomited by a female during pregnancy.*

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* Transactions of Medical and Physical Society of Bombay, No. VII., New Series, Appendix, page xxx.

SECTION II.

ETIOLOGY OR CAUSES OF DISEASE.

The causes of disease, are certain circumstances which precede, and either directly or indirectly produce it. They comprise the various forms of matter, and certain forces or qualities, of which heat, cold, and electricity are familiar examples. The relation between disease and its cause is sometimes very apparent, as in inflammation from the presence of a foreign body, the removal of which is equivalent to its cure. At other times the connection is by no means so clear, and has only been ascertained by repeated observations in a large number of instances; whilst it not unfrequently happens that the action of the cause is so transient, that it altogether escapes observation. Moreover, the real causes are often mixed up with other circumstances that are in no way operative, and from which it is difficult, and occasionally impossible, to eliminate them.

The causes of disease are *intrinsic* and *extrinsic;* that is, they may be generated or developed in some way or other within the body, or exist external to it. Of the first, the retention in the blood of noxious matters which should have been excreted is an example; of the second, heat, cold, impure air, improper food, mechanical and chemical influences, and the like, are examples. To enumerate all the causes of disease would be tedious. It may be stated generally, that they include everything which modifies the vital stimuli, *i. e.*, food, air, temperature, light, &c., or interferes with the due regulation of the passions and emotions of the mind; all material agents which inflict mechanical injury upon the textures, and chemical substances which enter into combination with some of their constituents; and lastly, matters whether solid, fluid, or gaseous, which, introduced from without, or formed within the system during natural processes, exert a poisonous influence.

It has long been observed, that all persons, and indeed the same person at all times, are not equally influenced by what are known to be the causes of disease. Thus, of several persons exposed to cold, one may suffer from a simple catarrh, one from an internal inflammation, whilst the remainder may escape. It is manifest, that those persons who were acted upon by the cold, were in some way or other in a different condition from those upon whom it produced no effect. The circumstances which led to this difference, or gave a susceptibility to the action of cold, were the *predisposing* causes; whilst the cold itself, which actually produced the disease, was the *exciting* cause. But it will have been noticed, that those who *were* affected were not affected in the same manner; the diseases produced were not the same. Not only, therefore, must there have been a general predisposition to render them liable to suffer at all, but also a local predisposition which determined the organ which became the seat of the derangement.

To understand the mode of action of predisposing causes of disease, it is necessary to call to mind the vis medicatrix naturæ, which has been already noticed (page 2). The conservative property of all animal organs, which is thus conventionally expressed, may be stated in few words, to become manifest by a capability or power of resisting the ordinary causes of disease. Of this, we have examples in the increased production of animal heat, by which the injurious effects of cold are prevented; in the secretion of tears, by which a grain of sand is washed from the eye; and in the vomiting and purging, whereby irritating matters in the alimentary canal are expelled. The vis medicatrix may be congenitally deficient, from causes which are traceable to the parents of the individual, or even to ancestors in a preceding generation, and there is ground for believing, that few persons are born in whom it is not in a greater or less degree weakened. On the other hand, the impairment may be mainly due to circumstances which are alone operative after birth. In either case, the causes of such impairment or weakening are the predisposing causes of disease, being in the one case hereditary, in the other acquired. The hereditary predisposing causes seem to operate in two ways:—1*st*, by a general weakening of the power of resistance, by reason of which the individual becomes more susceptible than others to the action of the exciting causes of all diseases; 2*nd*, by impressing upon the primary cell or germ a quality or endowment, which as surely leads to that abnormal nutrition which constitutes certain special diseases, as the ordinary endowments do to the healthy nutrition which determines the formation of the various textures and organs.

1. The circumstances which seem to impair the general resisting power, are want of strength and vigour on the part of one or both parents, from pre-existing disease, old age, general or sexual weakness, &c.

It is probable also, that intermarriages between persons allied by blood are followed by unhealthy offspring, just as "breeding in" is said to be in animals; but more extended observations upon this point are needed. There are certain races of men, Parsees in India for example, amongst whom such intermarriages are rather the rule than the exception, and yet the practice does not appear in them to be attended with the evil consequences which are attributed to it.

2. Special diseases, to which there is hereditary predisposition, are usually such as can be traced to one or both parents. As examples, cancer, scrofula, gout, and apoplexy may be mentioned. It does not however seem necessary that the immediate progenitor of the individual should have been affected. On the contrary, it is a remarkable fact, that one generation is sometimes passed over, the disease showing itself in the third from that originally affected.

It must not be supposed that hereditary diseases make their appearance at or even soon after birth; with few exceptions, they are not developed until the middle or advanced period of life. The catalogue of diseases that may be a sort of heir-loom in a family, is probably a very large one. It does not appear that transmission of disease is governed by any well-determined laws; diseases of a general or constitutional nature are, indeed, more frequently transmitted than those which are merely local, whilst such as are immediately caused by external injuries, do not pass beyond the individual.

It is plain, therefore, that two classes of causes may be recognised—the one, not itself producing disease, but so modifying one, or several, or all of the functions, as to render the system susceptible of the action of something which *does* produce it; the other immediately exciting disease, but for the most part not being capable of this, unless something had previously so deranged the vital functions and properties of the tissues and organs, as to diminish their capability of resisting its action, or in other words, had given a susceptibility to its influence.

These two classes are the *predisposing* and *exciting* causes. As a general rule, they co-operate in the production of disease; that is, an exciting cause will not be efficient without a predisposing cause, and the latter will not produce disease without an exciting cause. But to this rule there are many exceptions. The exciting cause may be so energetic and violent as to overcome the resisting power of the most healthy person. A violent blow will excite inflammation; a large quantity of improper food will derange the function of the stomach; and a contagious poison may be so concentrated as to excite fever in persons who have been protected from every predisposing cause. Conversely, a cause which is ordinarily predisponent, may from its intensity actually produce disease, without the intervention of any other. Thus, to take a familiar example, heat is usually a predisposing cause of disease, by lowering the tone of the system and rendering it susceptible of the action of cold, which is the ordinary exciting cause; but when the heat is very intense, it directly induces disease. It will be sufficient, in illustration of this fact, to direct attention to the deaths which have been caused by heat alone during military campaigns in the hot seasons of tropical countries.

Besides these two classes, it is usual to recognise a class of special causes, viz., those which occasion special and particular diseases, and which diseases can be produced in no other way.

The causes of disease will be considered somewhat in detail, and with reference to the distinction between *predisposing* and *exciting*. They will, as far as possible, be arranged in groups or classes. Such as are of the most importance must however received a separate notice; whilst some will be reserved for consideration in connection with the particular diseases which they are believed to excite. Lastly, prominence will be given to such causes of disease as are in a large measure operative in this country.

CHAPTER I.

PREDISPOSING AND EXCITING CAUSES OF DISEASE.

The predisposing causes of disease are—1*st*, all circumstances, whether hereditary or otherwise, which, by interfering with the nutrititve process, occasion a weakened or anæmic state of the system; 2*nd*, circumstances which lead to over-nutrition or a plethoric state of the system; 3*rd*, circumstances which produce a state of constitution in which there is a tendency to the occurrence of special diseases, as gout, cancer, scrofula; 4*th*, certain peculiarities of organization, giving rise to what are called temperaments; as the sanguine, the bilious, the nervous temperaments. As examples of predisposing causes may be mentioned heat, cold, impure air, excessive labour, various unhealthy employments, exhausting discharges, intemperance, previous attacks of disease, hereditary predisposition, mental states, temperament, age, sex, habits, over-nutritious food combined with insufficient exercise.

The most important of the exciting causes of disease are, those which act mechanically or chemically, improper food, excessive or defective exercise, states of mental depression or excitement, want of proper regulation of the passions and emotions of the mind, excessive evacuations, retention of excretions, want of cleanliness, defective drainage, temperature, poisons, &c.

Food improper in quantity or quality.—The quantity of solid food requisite to maintain health and vigour, must be proportioned as a general rule to the waste of tissue, and consequently is to be determined by the amount of bodily and mental exertion in which the individual is engaged. Numerous observations upon this point have fixed the minimum quantity at 17 ozs., the maximum at 36 ozs. in the twenty-four hours; this wide range being necessary to include persons who do and do not labour. But however true the general principle may be, as to the relation between the quantity of food consumed and the habits of the individual, allowance must nevertheless be made for numerous exceptional peculiarities. It is well known, that of two persons following the same occupation, one will thrive upon a diet upon which the other would starve. Nor of this is it easy, or indeed possible, to offer any satisfactory explanation. All that can be said is, that in the one the power of assimilating nutrient material is more active and efficient than in the other.

Food excessive in quantity.—When too much food is taken into the stomach, it deranges the function of that organ, and causes indigestion; vomiting is often excited, by which its expulsion is effected, otherwise it passes imperfectly acted upon by the gastric fluid into the intestinal canal, the action of which it deranges, causing colic or diarrhœa. Should the food be rich in nutrient matter, and the power of digestion and assimilation vigorous, a state of general plethora is induced, in which there is a tendency to gout, skin diseases, &c. Moreover, if at the time too much nutritious food is taken, bodily exercise should be neglected, fat is apt to accumulate, causing when beneath the skin inconvenience from its bulk, and when in or upon internal organs serious derangements, by hampering or suspending their function, either from being deposited around or within them, or actually substituting itself for the tissues of which they are composed. It is not uncommon for the heart to be surrounded by a layer of fat an inch or more in thickness, which acts upon that organ something in the same way that a heavy coat would upon a person engaged in active exercise. The fat is deposited between the fasiculi of the muscular fibres pressing upon them and leading to their atrophy, and lastly, in some cases actually within the sarcolemma, having destroyed and taken the place of the sarcous elements.

The quantity of food has not only relation to the function of nutrition, but should also be considered in its bearing upon the production of animal heat. For example, more food will be required in a cold than in a hot country, and in the cold than in the hot season of the same country, and especially of food which is abundant in heat-generating constituents.

Food deficient in quantity.—Complete abstinence from food causes death by starvation within from eight to ten days. The first effects of abstinence are emaciation, paleness of face, muscular weakness, and feebleness of pulse. After a time, however, a different class of symptoms sets in. The pulse becomes frequent; there is delirium, and sometimes palpitation of the heart and headache. These symptoms, which have the appearance of increased action or power, are in reality attended with increasing feebleness—the animal heat ceases to be generated, and death occurs in the way of syncope or asthenia. It is worthy of remark, that the stomach exhibits the appearances of inflammation. In the management of complete abstinence, great caution is requisite in administering food, which should be fluid at first, and given in small quantity at short intervals.

When food is habitually scanty and insufficient to support life, gradual starvation is induced. The pangs of hunger are felt for a short time only, and afterwards there is rather a loathing of food. The following phenomena are described by those who have had opportunities of watching such cases:—"A depression produced on the nervous system is very early manifested in the impaired energies of all the vital functions, the weakened conditions of the intellectual faculties and moral feelings, and diminution of the general sensibility. Disturbance of the cerebral functions is at first shown by an unnatural languor, despondency, and listlessness, slowness and obtuseness of intellect, with an inability to employ the thoughts steadily and profitably on any subject. Notwithstanding all this general languor, however, the patient sometimes manifests a highly nervous state: he is startled by any sudden noise, and hurried by the most trifling occurrences. He is liable to attacks of giddiness, dimness of sight, with temporary delirium, and either falls as in an apoplectic fit, or lapses gradually from a lethargic state into one of stupor, or even of complete coma."

It is very probable, that from amongst the large number of deaths in the chief cities of India, which are not distinctly traceable to organic disease, a considerable number is due to this slow kind of starvation.

Food, as is well known, serves two purposes; it replaces the loss or waste of tissue which is the result of every vital action, and is one of the factors in the production of animal heat. For nutrition it must contain a due proportion of azotised constituents; for the production of animal heat, the carbonaceous elements must be in sufficient quantity. Two great classes of aliments are therefore requisite, viz., azotised and carbonaceous or non-azotised. It is however certain, that four classes of alimentary substances are essential to the maintenance of vigorous animal life. 1. The nitrogenous, for the nourishment of tissue. 2. The carbonaceous, for combustion in the production of animal heat. 3. The fatty, which perform the double office of sustaining the animal warmth and assist in some way or other in the assimilation of the nitrogenous constituents. 4. The saline, for the supply of the osseous tissue.

Now there can be no question, that in varying proportions, which seem to be determined by instinct and experience, all those alimentary substances are essential, and that deficiency of any one of them will be followed by disease.

The researches of Dr. Christison have established the following facts:—

1. That the most successful dietaries for bodies of men, deduced from practical observation, contain carboniferous and nitrogenous food in the proportion of about three of the former to one of the latter by weight.

2. That while nitrogenous may replace carboniferous for supporting respiration (though at a great loss), carboniferous food (without nitrogen), cannot replace nitrogenous food for repairing textural waste.

3. The daily amount of nutritive principles of both sets must increase with exercise and exposure, otherwise the body quickly loses weight and ere long becomes diseased.

There are certain articles of food which contain all the constituents requsite for nutrition—bread and milk for example; and it is found, that persons will live longer upon the exclusive use of them, than upon any single article of food of any other kind. But however well on theoretical principles a person should thrive upon a single article of food which contains the requisite proportion of azotised and non-azotised constituents, yet in practice it is found that he will not do so. This arises from a feeling of disgust which the constant use of the same kind of food occasions, and which becomes in time so extreme, that the pangs of starvation are preferable to the effect required to overcome it. Hence

Effort

the evil consequences of imperfect nourishment will follow the use of food which is sufficiently nutritious, should it not from time to time be varied. It would appear also, that a due proportion of animal and vegetable food is required for the maintenance of health. At all events it is certain, that disease will be produced if vegetable food should be withheld; and on the other hand, a diet which is wholly vegetable will not maintain the body in health and vigour.

Food improper in quality.—Food may be improper in quality—1*st*, from containing non-alimentary matters; 2*nd*, from being deficient in nutritive or calefacient constituents, or in both.

The non-alimentary matters contained in food are salt, pickles, spices, condiments, &c. In small quantities they are useful, and some of them are essential to digestion; but in excess they are irritating to the lining membrane of the stomach, and occasion functional derangement of that organ, or congestion, or even inflammation.

Amongst the poorer classes of every country, deficient nourishment is closely related to many diseases. India forms no exception. It is not that food may not be procured in sufficient quantity to allay the pangs of hunger, but rather that it is of inferior quality, being deficient in those constituents which are essential for healthy nutrition.

The effects of imperfect nourishment are absorption of the fatty tissue, and general wasting of all the other textures, with the exception of the nervous tissue. Nutrient matter being insufficient, the blood is not properly formed, and becomes thin and easily extravasated. Nutrition is impaired, and in consequence of this, new material is not deposited in the place of that which is removed by decay or waste. This explains the wasting of the various textures, as also the occurrence of ulcers in the cornea and other parts. The deteriorated condition of the blood accounts for the spongy gums, local extravasations, and other scorbutic symptoms which are often present.

The proofs of the injurious consequences of imperfect nourishment are very abundant. They may be drawn from almost every country in almost every period of the world's history. Indeed, so obvious is the connection between food and disease, that famine and pestilence are associated together in most men's minds. Within the last half or quarter of a century, there have been several striking examples of such relation, as well in this as in other countries. In the year 1817-18, a famine prevailed in the provinces of Cutch and Kattiawar. This was followed in the year 1819 by an adynamic form of fever, from which the mortality was very great. A similar fever followed a famine in Marwar, and broke out at Pali in the year 1836, from which it is said that four-fifths of those attacked died. In the year 1845, the potatoe crop in Ireland, upon which large numbers of the people depended for their food, was destroyed. A famine was the result; many died from starvation, but these were few compared with those who were carried off by disease. Thousands of persons suffered from contagious fever, the virulence of which was so great, that it attacked a seventh of the people amongst whom it prevailed, and one out of every nine of those affected died.

Exposure to great heat.—Within certain limits, and for a short time, exposure to heat can be borne without injury. Persons have entered and remained for some time in ovens, the temperature of which had been raised to 260° F. The only effect was a quickening of the pulse and increase of the secretion from the skin. There was no rise in the temperature of internal parts. But continued exposure to a high temperature, and particularly if the system should be fatigued, is followed by serious derangement. In its minor degree this presents the characters of continued or remittent fever, but in its more severe form, the nervous system is directly or indirectly implicated, the respiratory function impaired, and death, sometimes in the way of syncope, at others of coma and apnœa, more or less rapidly occurs.

There has been, and still is, much discussion as to the manner in which heat acts in producing these results. By some it is thought to effect the nervous centres directly, causing death in the way of syncope or apoplexy. Others ascribe its action as primarily upon the solar plexus, and subsequently upon the heart, the function of which is suspended. The throbbing of the carotids, the heat of the head, and the delirium, which are the marked symptoms in certain cases, have been viewed as indicating the existence of encephalitis. Of late the opinion, that the condition of the blood is in some way altered has gained ground, and attempts have been made, but without success, to determine the particular kind of derangement to which the symptoms are due. It must be confessed, that our knowledge of the mode of action of intense heat in causing disease is very limited. One very obvious mode, however, in which it may operate, appears to have attracted but little attention. May it not be, that refrigeration by the skin being inefficient, a rise in the temperature of the blood and solid textures is actually produced?

Exposure to cold.—Just as exposure to a high temperature is not necessarily followed by disease, so may exposure to even extreme degrees of cold, under certain circumstances, be borne with impunity. The inhabitants of, and travellers in, Arctic regions, may be adduced in illustration of this fact. The injurious effects are, no doubt, in such cases warded off by an increased production of animal heat, for which abundance of carbonaceous food and free exercise in the open air are essential. But when there is a want of relation between the heat-generating power and the depression of temperature, as happens when food is deficient, the system fatigued, or the various functions feebly performed, cold acts as a general sedative, causing death by syncope and coma.

Exposure to intense cold causes drowsiness, and if the desire for sleep should be indulged, coma and death. Sometimes a state is induced which resembles intoxication—the intellect is confused, and the sensations are blunted, and there is difficulty in getting answers to questions, similar to that which is observed in persons who have been drinking. This effect of cold is most common in those who are ill fed. It might perhaps be thought, that in tropical climates derangements from cold would not occur, but it must be remembered, that the capability of resisting the action of cold is proportioned to the power of generating animal heat. This power, as is well known, is lessened by the prolonged influence of a high temperature; hence it follows, that an amount of cold which in a temperate climate would be innocuous, will in a tropical region be extremely prejudicial.

It may also be observed, that in many, if not in all, parts of India, little attention is paid by the Natives to the adaptation of clothing to the season of the year. Amongst the lower classes there is little difference between that worn in the month of May and in the month of December, and yet the range of temperature between these two months is very considerable. In regard to young children this fact is still more striking; they wear little or no clothing during any season of the year.

The effects of direct exposure to cold are not unfrequently witnessed in the Jamsetjee Jejeebhoy Hospital at Bombay, and it may be presumed in other large hospitals in India. In the cold nights of December and January, persons are picked up by the Police in a state of insensibility, who, on being brought into the hospital and roused, present all the characters of incipient intoxication. The absence of any smell of liquor, and the circumstances and caste of the individual, are often sufficient to show that the excitement is not that of intoxication.

Habitual exposure to a moderately high temperature.—The first effect of a moderately high temperature is to stimulate the organic functions. Thus, persons who have newly arrived in a tropical country, suffer from derangements which are the consequence of over-secretion, as for example "bilious diarrhœa." Such over-excitement is followed by weakness, in accordance with a well-known law of the animal economy; and consequently the derangements caused by increased functional activity are followed by those which have an opposite origin.

Much importance has been from time attached to the effect of heat in altering the physical condition of the atmosphere. The expansion and rarefaction of the air thereby induced, diminishes the quantity of oxygen which is introduced into the lungs during each inspiration, and by reason of this, less than the usual quantity of carbonic acid is exhaled. Hence, it is said, that there is an accumulation of the last named gas in the blood, and which is removed by the vicarious action of the liver, at the risk of derangement of the function of that viscus.

Without disputing the explanation just given of the immediate effect of a high temperature, it is probable that a very short time only elapses before the accumulation of carbonic acid ceases. The diminished appetite and desire for food rich in carbon, which every one experiences soon after arriving within the tropics, is evidence that the quantity of carbon which is introduced is being brought down to that which is proportioned to the quantity of oxygen inspired.

The period which elapses between the first exposure to a tropical temperature and the completion of the process just referred to, and which varies in length according to the habits of the individual, may be viewed as a period of acclimatization, during which those diseases (bilious derangements, continued fever, &c.) which are popularly known as acclimatizing diseases are likely to occur. In the Natives of the country, there is at no time any disproportion between the carbon and oxygen, and they do not therefore suffer from acclimatizing diseases.

The profuse secretion from the skin which a high temperature occasions, is in a great measure compensated by the increased imbibition of fluids, and diminished secretion from the kidneys. Still, there can be no doubt that it has a weakening or enervating effect, besides immediately causing cutaneous diseases. It is, however, long-continued exposure to a high temperature which causes so marked a predisposition to disease. The muscles lose their tone, and the action of the heart in consequence its vigour. The circulation being feeble, the nutritive function is imperfectly performed. From the function of respiration having less than its natural activity, less oxygen is taken into the blood, and the products of decay are consequently imperfectly eliminated. The sum of the effects of long residence in a tropical climate, is a state of general anæmia, in which the system is predisposed to be acted upon by the ordinary exciting causes of disease.

It is often remarked, that a high temperature (except when excessive) does not actually produce disease. The hot seasons of the year within the tropics are not the most unhealthy; it is rather at the beginning of the cold season that disease is most rife. This is easily explained. The sudden depression of temperature acts upon those who have become predisposed by the heat of the summer months. In like manner in England, it is not until the commencement of the autumn that disease begins to prevail after a hot summer.

Exposure to cold and alternations of temperature.—Injurious as is sometimes the effect of intense cold, judicious exposure to cold is tonic and strengthening. The benefit derived from change from a warm to a cold climate, and from cold bathing, may be mentioned as examples. But irregular exposure to cold, or the exposure of persons whose systems have been weakened by exposure to great heat, or any other depressing influence, is a common cause of disease. Most internal inflammations and many other diseases are produced by it. Moreover, diseases which are due to a morbific agent in the blood, but which has been long latent, are often called into existence by a sudden fall of temperature ; intermittent fever is a familiar example of this in tropical countries.

It is a point of great importance to notice, that the effects of cold are in proportion to the power of generating animal heat. The circumstances which interfere with the heat-generating function, are fasting, fatigue, night-watching, much study, sleep, previous disease, and indeed everything which impairs the nutritive function. As in tropical climates nutrition is always below par, it is evident that the causes above-mentioned will be operative to an unusual degree, and thus an amount of cold, which in a temperate climate could be borne without ill consequences, will in a tropical country be productive of disease.

The effect of cold in causing internal disease, seems to be increased when it is partially applied. Thus, persons sitting with wet feet are more likely to be attacked than if the whole body had been exposed. It is also in the highest degree injurious, if applied when the body which had been previously heated is rapidly cooling, for then the power of generating animal heat is greatly diminished. On the other hand, during excitement of the circulation, or when the body is heated before the process of cooling has commenced, sudden transition from heat to cold is in no way hurtful. It is a familiar fact, that in Russia the practice is common, for persons to transfer themselves at once from a hot bath to one below the freezing point. The beneficial effects of cold bathing in certain forms of fever are also well known. The practical inference to be drawn from these facts is, that the circulation being vigorous, and the heat-generating power active, sudden transitions from a high to a low temperature may be borne with impunity. But when the circulation is feeble, or when heat is but sparingly generated, such transitions are in the highest degree prejudicial.

The injurious effects of cold are heightened when the air is in motion, and especially if the person should be exposed to a draught or current of air; also if accompained by moisture. They are diminished by habit, by avoiding warm or heated rooms, by free exposure in the open air, and by the daily practice of cold bathing. But the so-called hardening processes must be adopted with caution; they are inapplicable to young infants, and must be cautiously used by delicate persons, and especially females.

It has been thought, that cold acts through the medium of the nervous system, and that the sensation it produces is in some degree a measure of its effects. But it is certain, that many derangements due to cold or alternations of temperature, are produced without the individual having been aware of any particular impression or sensation at the time the cold was applied. Moreover, the most intense feeling of cold may not be followed by disease.

There are two modes in which cold may act in causing disease. It may constringe and diminish the calibre of the vessels of the skin, diminish the quantity of blood circulating through that texture, and increase the quantity which is contained in the vessels of internal parts and organs. Such congestions or determinations of blood impair the functions of these organs, and lead to the accumulation of excrementitious matters in the blood. In the second place, cold suspends the secretion from the skin, and throws upon other organs the duty of eliminating from the blood certain noxious matters which should have been removed by it.

Impure air.—The air we breathe is not only liable to changes in the proportion of its constituent gases, which unfit it for the performance of the respiratory function, but it is also the medium through which various poisons in a gaseous state enter the blood. It is consequently easy to understand, that impure air may become one of the most fertile causes of disease.

Oxygen deficient in quantity.—The quantity of oxygen may be deficient from the air being expanded or rarefied, or from the presence of a foreign gas. The effect of rarefaction of the air is felt at the tops of high mountains, and has been studied at the hill sanitaria of India. The number of respirations is found to be increased, and the action of the heart accelerated. The explanation of this is sufficiently simple. At the Mahableswur Hills, in the Bombay Presidency, for example, the altitude of which is about 4,500 feet, a person takes in at each inspiration one-sixth less air by weight than at the level of the sea. It consequently follows, in order that the blood may be duly oxygenated, that the respirations must be increased in number. Persons in health do not suffer more than occasional inconvenience under active exercise; but should the respiratory function be impaired from disease, as of the lungs or heart, serious derangement is not unfrequently produced. The quantity of oxygen is likewise diminished by some other gas being mixed with the air. The gases which are the most often present, are carbonic acid, carbonic oxide, and carburetted and sulphuretted hydrogen; but inasmuch as these gases when inhaled are in themselves poisonous, the effects of such impurity must be positive as well as negative. It has been found by experiment that, when air which contains even a small proportion of carbonic acid gas is inspired, the elimination of that gas from the lungs is greatly impeded. Hence the respiration of air containing it is not only hurtful, by directly introducing that gas into the system, but also by preventing its removal. Moreover, the injurious effects of carbonic acid gas are in proportion to the reduction of oxygen; so that the displacement of a portion of oxygen gas by carbonic acid gas, is followed by more serious consequences than if the same quantity of the latter had been added to air which contained the usual proportion of its constituent gases. There is ground for the belief, that 4 or 5 per cent. of carbonic acid gas in the air would be dangerous to life, and that less than half this amount would soon be fatal should it have been formed at the expense of the oxygen of the air. When carbonic acid gas is inhaled in large quantity, it causes giddiness and loss of muscular power, and afterwards sleep, which is succeeded by coma and death. The venous system is found to be filled with blood of a dark colour, and the lungs and brain especially congested. Carbonic acid gas is therefore a narcotic poison. It is, however, the admixture of small quantities of this gas with air that is chiefly the subject for present consideration. Every one is aware of the discomfort of being in an over-crowded and badly ventilated room; the sense of constriction about the chest, the giddiness, the sickness, and perhaps feelings of faintness that are occasioned. Such effects are not uncommon when the proportion of the gas is not more than half per cent. Carbonic acid gas may, indeed, exist in quantity so small, as not to cause any immediate derangement, and yet the continued respiration of air thus contaminated is very prejudicial; the vital functions are depressed; nutrition is imperfectly effected; mental and bodily activity are diminished, and a predisposition to epidemic and other diseases induced. Three things are combined in causing these effects, viz:—The poisonous action of the gas; the diminished quantity of oxygen which the air contains; and the impediment which the inspiration of such air offers to the elimination of carbon.

Sources of carbonic acid gas.—Besides existing as a natural product in many parts of the world, carbonic acid gas is generated by combustion, and given off during vinous fermentation. But it is as a product of respiration in over-crowded and ill-ventilated rooms that it becomes so potent a cause of disease.

In tropical countries, the construction of the houses, and the open windows which the heat of the climate renders necessary, provide for better ventilation than is common in the houses of the lower classes in colder countries. But as a set off against this, heat and moisture increase the effects of bad ventilation.

Air vitiated by gases arising from the decomposition of organic matter.—Some of the products of the decomposition of organic matter can be recognised in the atmosphere by their smell, as sulphuretted and carburetted hydrogen; others, which in all probability are not binary, but ternary or quaternary compounds, are not evident to the senses, and have not been separated.

The poisonous properties of sulphuretted hydrogen have been amply proved by experiments. A hare was killed by breathing air which contained 290 parts of it, and another died in a minute after several quarts had been injected into the intestinal canal. A rabbit died in ten minutes after being so surrounded by it that the gas could enter through the skin alone. Quantities of sulphuretted hydrogen, short of being absolutely poisonous, cause great prostration of strength and nervous derangement, with a tendency to convulsions and stupor, whilst in very small quantities it produces nausea, drowsiness, and nervous pains.

The effects of other exhalations from decomposing organic matter, cannot be eliminated from those of sulphuretted and carburetted hydrogen; but there is no question, that habitually breathing an atmosphere which is impregnated by them, is most destructive of health; for if they do not absolutely produce, they afford a remarkable predisposition to some of the most fatal forms of fever (typhoid and typhus). The sources of these deleterious exhalations are open drains, cesspools, privies, &c. The custom so general, even in large towns in India, of resorting for natural purposes to every spare piece of ground, decency and health being alike disregarded, is very prejudicial; at the same time it must be confessed that, until a system of drainage and sewerage shall have been introduced, it is probably less hurtful than the accumulation of filth and ordure would be in privies and cess-pools.

In addition to the impurities already noticed, the atmosphere may contain matters capable of producing *endemic*, *epidemic*, and *infectious diseases.*

1. *Endemic causes of disease.*—There are certain diseases which appear to be confined to, or to be much more frequent in, particular localities, the causes of which have not been ascertained. Such, for example, are gout, bronchocele, elephantiasis, and guinea worm. These will be noticed in a future chapter. One great class of diseases, not producible by the ordinary exciting causes, has been chiefly, if not solely, met with in certain districts or countries where heat and moisture operate in an unusual degree upon the surface of the earth. It is supposed, that the result of such action is the production of an aëriform poison, which has been called miasma, marsh poison, and malaria. The latter designation will be employed.

Of the physical or chemical properties of malaria we know nothing. It has eluded all attempts to detect its presence; and, indeed, air which is believed to be impregnated with it, does not differ in its natural or chemical properties from the purest air we breathe. All therefore that we know of malaria, is from the study of its effects, and of certain laws by which it appears to be governed.

When persons live in those places which are favourable for the production of malaria, they suffer from remittent and intermittent fevers, an anæmic or cachectic state of the system, and enlargement of certain organs, as the spleen and liver. These will be described as a part of Special Pathology; in the meantime a few general remarks will be made upon the subject of malaria.

MALARIA.—*Production of malaria.*—Heat and moisture acting upon the earth's surface, seem essential to the production of malaria. Thus, it is chiefly met with in tropical countries, in which there are heavy periodical rains, or where the banks of rivers are inundated. How far vegetable putrefaction is absolutely necessary, is still a matter of doubt. It is said that malaria is generated in desert countries where vegetables do not grow; but it is difficult to conceive the possibility of the entire absence of vegetation when heat and moisture are present. But whether dependent upon vegetable putrefaction or not, the production of malaria is frequently associated with it. Although moisture is essential, its excess to some extent prevents the development of this poison. Thus, during the inundations which arise from the overflow of rivers, or during heavy rains, the effects of malaria are much less felt than after their cessation, when the ground has begun to dry.

Malaria clings to the air near the ground.—It is noticed that people who live in the lower rooms of a house suffer more from malarious fevers than those in the upper story. It has also been said, that it does not ascend upon the sides of mountains, but this requires further investigation.

Malaria is attracted by the foliage of trees.—There are jungly districts in various parts of India, through which it is unsafe to pass during many months of the year. The Terai, at the foot of the Himalayas, and the jungle on the road to Mhow, in the Bombay Presidency, may be mentioned as examples. It is at least doubtful if malaria is actually generated in greater quantity in these places than elsewhere; their malignancy is probably due to its concentration, on account of being attracted by the foliage.

Effect of water on malaria.—It has been obseved, that sailors on board ships which are anchored at a little distance from the land, suffer less than those on shore. So also the residents on the banks of lakes are more exempt than those who are at an equal distance by land from the source of malaria. This fact also explains the protective influence of heavy rains. The large quantity of water which lies on the ground is believed to hold in solution the malaria which was previously being evolved. It is probably owing to affinity between moisture and malaria that this agent is more potent during the night, and before the fogs and dew have been dissipated by the sun. Being entangled by the moisture near the ground, its diffusion through the atmosphere is prevented. This is a point, the knowledge of which is of practical importance, for by carefully avoiding exposure in the morning before the sun has risen, or in the evening after it has set, persons may sometimes escape fever though travelling or living in malarious districts.

Effect of wind on malaria.—In foggy weather, it is said that malaria may be carried to a distance of five or six miles, so that fever has sometimes prevailed in a locality where the sources of malaria did not appear to exist. Its progress through the atmosphere is impeded and sometimes stopped by a mountain or a thick wood or jungle. Dr. Wood, of Philadelphia, mentions the remarkable circumstance, of a family, previously in good health, becoming attacked with a severe and fatal fever in consequence of an avenue having been cut through a thick wood, which was situated between their house and a large tract of marshy ground.

Effect of cultivation upon a malarious district.—At first, from the exposure of an extensive surface of newly turned up earth, the malarious influence is increased, but afterwards, from the grounds being drained, and probably other causes, malarious fevers have in many instances ceased to prevail.

Malaria is said to be neutralised by the air of large cities.—It is alleged, that though malarious fever may surround a large city, and even prevail in the outskirts, it does not affect the residents in the centre. Rome has been adduced as an example; and the fact is believed to have been abundantly established in some of the large towns and cities of the United States of America.

Channels through which malaria is believed to enter the system.—That malaria is very generally received into the system through the organs of respiration is the general belief; when, however we remember that there is reason for supposing it to be readily absorbed by water, it is possible, if not probable, that it may be conveyed through the channel of the stomach. That it may also be absorbed through the skin, is in accordance with analogy, though absolute proof of its entrance by this channel is wanting.

Effects of malaria.—Malaria directly produces fever besides which it induces a cachectic state of the system, with a tendency to congestion of internal organs, and especially of the spleen and liver. Dysentery and diarrhœa are also thought to have sometimes a malarious origin, but this is at least doubtful. That the cachectic state which is induced by living in a malarious district, predisposes to these diseases is quite true, but there is not sufficient evidence to prove that there is any more close relation between them.

Nature of malaria.—The nature of malaria is altogether unknown. Although the belief is almost universal that it is aëriform yet no abnormal gas can be discovered in the air of malarious places. This, and the fact that so-called malarious diseases sometimes prevail where the generation of malaria seems unlikely, has led some persons to deny its existence.*

Epidemic causes of disease.—A disease sometimes attacks a large number of persons almost simultaneously, remains for a longer or shorter time, and then disappears to recur in a locality at no great distance from that in which it commenced. In this way it may travel over a whole district, country, or hemisphere, gradually dying out, it may be in regions far removed from that in which it originated. Such disease is an epidemic disease, and the cause of it, which is believed to exist in the atmosphere, an *epidemic* cause. The term "epidemic" is derived from two Greek words signifying "upon" and "the people," as if it descended upon a community from above. As examples of epidemic diseases, may be mentioned influenza and cholera. These diseases, and some others, appear as a general rule to have no other source than the state of the atmosphere, which the epidemic influence may be supposed to occasion; but there are other diseases, the causes of which are clear and palpable, as small-pox or malarious fever, which at times assume the characters of an epidemic visitation; that is to say, they prevail in a town or district at some particular time or season with unusual violence, a large proportion of the inhabitants being affected. Hence it appears that many diseases, not immediately produced by epidemic causes, may be rendered much more frequent by them. It is not known whether the epidemic influence operates by increasing the intensity of the exciting cause, or by rendering persons more susceptible of its action. It sometimes happens, that in place of exciting or giving a prevalence to disease, the epidemic influence stamps a peculiar character upon those diseases which are prevailing; for example, at one time, or in one season, pneumonia is attended with great prostration of strength, which forbids the use of depleting remedies, at another, by symptoms such as demand the abstraction of blood; and this, it should be observed, does not merely apply to this disease as affecting individuals, but as it occurs in masses or communities.

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* Attempts have been made, but I do not think with any success, to connect the production of malaria with certain geological peculiarities of the locality, as for example, the presence of ferruginous soils.

Various hypotheses have been invented to explain the origin of epidemic diseases. They have been attributed to the presence in the air of gases, the result of volcanic action; to some change in the electric tension of the atmosphere; to the presence or absence of ozone, &c. The fact that they often travel against prevailing winds, would seem to show that the cause is not of a gaseous nature. The hypothesis which seems the most deserving of notice, is that which ascribes them to the development and propagation of microscopic animalcules. The following facts are stated by Dr. Williams in support of this doctrine:—

1. "Epidemic diseases resemble the effects of the blight insects, by appearing and disappearing without evident cause in uncertain places and at uncertain periods. 2. Unusual swarms of insects, and various epidemic visitations, have been frequently remarked as occurring together, although, it must be

confessed, that no uniformity has been found to obtain in either the character of the insects or of the diseases. 3. Fresh proofs are continually coming under notice of the existence of parasitic animals and plants in living animals, often, too, unmistakeably presenting themselves as causes of disease; this is seen in intestinal worms and other entozoa, the acari of the itch, and the rot-worm of the sheep. 4. The history and symptoms of such epidemic diseases as cholera and influenza, are in no way inconsistent with the hypothesis that they are caused by the sudden development of animalcules from ova received into the blood." It may also be observed, that the animalcular hypothesis seems to explain some of the remarkable peculiarities in the propagation of epidemic diseases. As, for example, that they travel in the teeth of prevailing winds, and are sometimes conveyed by the movement of bodies of men, the germs, it may be supposed, being contained in their clothing. So also, it seems to account for the irregularity and apparent caprice which epidemic diseases exhibit in their movements: "At one time directly onwards with a slow regular march, at another halting as if for rest; now in a compact body with a broad sweeping front, then again in detachments diverging from the main line; sometimes leaving no blade of life unvisited, and again passing over large tracts untouched, and settling down devouringly on some distant and isolated spot."

The laws which regulate the epidemic influence are imperfectly known. The following facts have however been determined:—

1. It directly excites diseases which are of a character different from those which ordinarily prevail. Cholera and influenza are examples. But it more frequently operates in giving an increased susceptibility to, or increasing the intensity of, the causes of other diseases.

2. When an epidemic disease prevails, *all* diseases within the sphere of its cause are apt to partake of its character. Thus, it has been noticed, that during an epidemic of cholera, other diseases are often complicated with looseness of the bowels.

3. The extent to which the epidemic influence reaches, is not always the same. Sometimes it is limited to a street or a town;

at others it overspreads a whole district, province, or country. So, also, there is much difference in the rapidity with which it travels from one place to another; at one time appearing to occupy every part of a large district almost at the same moment, at another proceeding with the utmost slowness, many months and perhaps years having elapsed before it shall have reached over any considerable extent of country. Further, nothing can be more capricious than its mode of progression. Now in a determinate regular course from which no part escapes, now jumping or skipping over large tracts of territory. Sometimes it follows a zig-zag course, every now and then halting or even retracing its steps. Very often its approach is heralded by slight derangements, resembling the disease which is to follow becoming common. An epidemic of cholera is often preceded by an unusual prevalence of diarrhœa, but not unfrequently its first attack is sudden. The severity of epidemic disease is the greatest at the beginning of the outbreak, the mortality gradually lessening as it begins to decline.

4. The duration of an epidemic disease follows no fixed rule, neither does the period of its return. Influenza has been known to disappear in a few weeks, and cholera has never continued in Europe at any one time for more than a few years, whilst in India it has existed so long that it may almost be said to have become endemic.

Infectious and contagious causes.—There are certain diseases which are conveyed from one person to another; that is, in the body of a person affected with a particular disease, a poison is generated which, being received into the blood of another person, produces a precisely similar disease. Such diseases are called infectious or contagious. These terms are often used in the same sense; but it must be remembered, that some diseases are *contagious* but not *infectious*—itch and syphilis are examples; and although many infectious diseases are likewise contagious, all are not known to be so; measles and scarlet fever have never been conveyed by touch or inoculation. The poison of infectious and contagious diseases may be received into the system by being brought into contact with the skin or mucous membrane by being introduced beneath the cuticle or inoculated, and by being inhaled during respiration.

Syphilis and gonorrhœa are produced by simple contact, as are also those skin diseases which are due to parasitic developments. It is probable also, that some aëriform poisons may be absorbed by the skin. Some poisons do not appear to pass through the cuticle, but are readily absorbed if placed beneath it. The poison of a rabid animal, and the virus of the vaccine disease, are examples. It is certain that neither hydrophobia nor a vaccine vesicle can be produced without an abrasion of the cuticle. By far the greater number of infectious diseases are the result of the inhalation of a poison, probably gaseous, along with air during respiration. It may be supposed, that the atmosphere around an affected individual becomes charged with exhalations from his body, and consequently the person who may breathe such an atmosphere, inhales during each inspiration a certain amount of poisonous matter. There is, however, great difference in different infectious diseases as to the extent to which the air becomes contaminated. The poison of typhus is believed not to reach more than a few feet, whilst that of small-pox has been known to pass not only through every room, but from one house to another. The atmosphere may also be contaminated to a limited extent, by the poisonous matters of infectious diseases having adhered to articles of clothing and the like, and this will account for such diseases sometimes being conveyed to great distances.

Some infectious diseases are capable of being introduced through all the above channels, as small-pox, plague, &c., others through one only, as syphilis and hydrophobia. It has been and still is a question, whether infectious poisons can be conveyed through the channel of the stomach. The researches into the pathology of cholera, during the last epidemic of that disease in Europe, would seem to show the probability at least of this disease being sometimes caused by an admixture of the evacuations from the intestinal canal with the water of tanks and rivers. There is also reason to suppose that malaria may be introduced by drinking water which is impregnated with it, and if this should be really the case, analogy would be in favour of a similar mode of entrance in the instance of infectious poisons.

The effect of contagion is sometimes local, as in certain skin diseases; more frequently the whole system is contaminated.

The difference in the activity or virulence of contagious poisons is very striking. Few persons exposed to the contagion of small-pox escape, unless they have previously had the disease or been vaccinated; whilst many pass though life without having scarlet fever, although often in attendance upon persons suffering from that disease.

When persons are affected with a contagious disease which is not local, their bedding and clothing, &c., are apt to be impregnated with the exhalations from their bodies; and when a contagious disease is raging in a town or village, various articles of merchandize attract it. It is said to cling most readily to bales of wool, silk, and cotton. In this way contagious diseases have been conveyed to countries distant from that in which they originated. For many years small-pox was unknown in Australia, but during the vast immigration to the Colonies which took place in 1853-54, the fomites of the disease, *i. e.*, matters impregnated with the contagious influence, were conveyed to Melbourne. Small-pox has since prevailed in most of the Australian settlements.

The exhalations from the bodies of persons affected with contagious diseases are rendered inert by free admixture with the air, and they appear to be destroyed when exposed to a temperature of 120°. Two practical rules may be deduced from these facts, viz:—1*st*, diseased persons should be surrounded by a free circulation of air; 2*nd*, articles of clothing or merchandize, which are suspected of being "fomites," should be boiled or heated. The properties of contagious matters are also destroyed by various chemical agents, as for example chlorine. The lapse of time is also said to diminish if not destroy "fomites;" but there are on record facts which go far to show that, when prevented from mixing freely with the atmosphere, the virulence of contagious poisons continues for months if not years.

It is a well ascertained and remarkable fact, that a contagious poison does not produce its effects directly it is received into the system; several, and in some instances many days or weeks elapse during which it is impossible for the individual himself from his feelings, or for others from observation, to know or even suspect that he has been infected. The time which intervenes between exposure to contagious influence and the occurrence of the first symptoms of the disease, is the period of incubation. It is tolerably constant in the same, but varies in different contagious diseases from two or three to twelve or fifteen days, several weeks, or even months. When the effect produced by contagion is not merely local, the disease is for the most part a fever, of which depression of the vital powers is in greater or less degree a symptom. Such fevers, with few exceptions, run a definite course, of which certain parts can be distinguished as stages. They are usually attended with an eruption on the skin, and most of them, as a general rule, occur only once in the same individual; that is, one attack renders him insusceptible of fresh contagion.

It has been a subject of discussion, whether or not a contagious disease *can* occur without contagion. It is certain that *all* contagious diseases must have arisen spontaneously; but it is doubtful if at the present time the greater number (*i. e.* small-pox, scarlet fever, measles,) ever occur when contagion is wanting. The first outbreak of the diseases above-mentioned in the dependencies of the British Crown, has been invariably traced to the arrival of ships in which they have prevailed during the voyage. And, it may be, that the absence of scarlet fever in Western India, is simply due to the circumstance that the fomites of that disease have not as yet been imported. But there are diseases, that under certain circumstances undoubtedly propagate themselves by contagion, although their origin has been due to other causes; cholera and dysentery are examples. Indeed, it is more than probable, that under the adverse circumstances of defective ventilation, want of cleanliness, and over-crowding, the greater number of serious diseases, not generally contagious, may acquire the power of transmission from one person to another.

It must not be concealed, that views different from those above expressed, are entertained by men of great experience, and whose opinions are entitled to the greatest respect. Dr. Wood of Philadelphia states, that many, perhaps all, contagious diseases may arise from other causes than their own peculiar contagion, and may afterwards propagate themselves by contagion in the ordinary way.

There are two ways in which it has been conceived that the poison of contagious diseases may act:—1. They have been considered as of the nature of ferments, which, being received into the blood, cause chemical changes, that result in the increase or multiplication of the septic agent, just as a small quantity of yeast, introduced into a liquid capable of fermentation, is increased a thousand-fold. Under this view, the febrile symptoms so generally present, would be considered as the reaction of the system which is necessary for the elimination of noxious matters from the blood. 2. The hypothesis has been put forth, that a contagious poison consists of the germs or ova of animals, or the seeds or sporules of vegetables, which find in the blood a nidus for their development.

The belief that *endemic*, *epidemic*, and *contagious* poisons may act as ferments, causing decomposition and putrefaction of the blood, has led to the use of the term "*zymotic*" to designate them, as well as many other similar causes. The diseases thereby produced are named zymotic diseases. Zymotic agents may be so intense and concentrated, as to act upon the most healthy persons, but for the most part they require a state of susceptibility or predisposition. This state is believed to be afforded by weakened and debilitated conditions (see page 91), and in a marked degree whenever there is much azotised matter present, as happens during the rapid disintegration of tissue which occurs after child-birth, severe injuries, surgical operations, fatigue, &c., also in impaired action of the depurating organs in consequence of close confinement in impure air, or exhaustion of vital power from intemperance and habitual excesses.

The means which are usually adopted for preventing the spread of zymotic diseases, are the enforcement of cleanliness, and free ventilation, and in some instances the segregation of those infected. The destruction of the zymotic influence is believed to be sometimes effected by the use of certain chemical agents called "disinfectants."

The power of disinfectants in actually destroying zymotic poisons, although it may not be disputed, is undoubtedly very limited. This may possibly arise from the practical difficulty of bringing them into absolute contact with the matter upon which they are to act. It is certain that much more may be done in preventing their production by proper sanitary arrangements, than in destroying them after they have been formed.

In tropical countries, " malaria" is out of all proportion the most common of the zymotic poisons. The soil for the growth and extension of other zymotic poisons is no doubt sufficiently abundant in the neglect of ordinary sanitary arrangements, which is no where perhaps more apparent. But there are special circumstances in hot countries which seem to limit the operation of these agents. The temperature alone may have an influence in preventing the generation of certain of these poisons, or at least of diminishing their intensity. It is known, that a heat of 120° will decompose the most malignant fomites, and experience has shown, that some zymotic diseases do not occur within the tropical zones; plague and perhaps typhus fever are examples. Putting, however, the action of heat on one side, the more free ventilation of the houses, which the climate of tropical countries renders necessary, must facilitate that diffusion of the morbific agent through the atmosphere which is so effective in neutralizing it. But there are practices in a measure forced upon classes of people by custom or caste, which are pre-eminently calculated to develope zymotic poisons. The association together of several generations of the same family in one house, as is common amongst Parsees, and the pilgrimages to shrines, which are of annual or more frequent occurrence amongst Hindoos, may be mentioned.

The outbreaks of disease, which are so common amongst pilgrims to Hurdwar, Punderpoor, and other reputed sacred places, suffiently prove the effects of such pilgrimages; and not only do zymotic diseases prevail amongst the pilgrims, but the poison is conveyed by them on their return to almost every part of the country. The occurrence of epidemics of cholera in Bombay has been on several occasions traced to the return of pilgrims from Punderpoor.

The remarkable effect of the rainy season in Western India, in modifying if not suspending the operation of certain zymotic agents, has not hitherto been sufficiently noticed.

Exercise of body and mind, excessive or defective.—Violent muscular efforts, such as in running, wrestling, lifting heavy weights, and the like, are often the direct causes of disease. The circulation being hurried, and the heart excited to inordinate action, undue pressure is made upon various important organs; the brain, lungs, and even the heart itself are apt to suffer, either in function or structure. These effects are most commonly produced when there is weakness or defect in the structure of an organ, a condition which, falling short of actual disease, may be present at all ages, and is almost certainly so in the advanced periods of life. It must not be inferred that active muscular exertion is to be always avoided. During early adolescence, athletic sports, involving considerable muscular effort, so far from being prejudicial, rather tend to the proper development and growth of the human frame. In a less degree, the effects of excessive exercise are giddiness, faintness, loss of appetite, indigestion, sleeplessness, and restlessness.

But efficient as violent *bodily* exertions is in causing disease, undue exercise or excitement of the *mind* is not less potent. The most common immediate effect of severe mental disturbance is upon the heart, which it either excites to increased action or depresses to the verge of syncope or death. Thus, persons have died from fear, grief, or even joy, sometimes in the way of coma or apoplexy, but more frequently of syncope. Other organs also suffer; attacks of spasmodic asthma, inflammation of the brain, epilepsy, chorea, and insanity, are said to have been in this way occasioned.

The effect of mental emotion upon the secretions is very remarkable. Under grief or anxiety some persons suffer from looseness of bowels, others from excessive secretion of urine; jaundice, hæmaturia, and deranged menstruation have also been traced to this cause. Long-continued grief or anxiety seems to be a common cause of many functional diseases, as dyspepsia, costiveness, diarrhœa, hepatic derangement; whilst chronic organic diseases, particularly those of a degenerative nature, are often produced by it.

The influence of close mental application or depression upon the nutritive function, is the subject of common observation. Emaciation, and a large amount of urea, lithates, and phosphates in the urine point to the decay and waste of tissue which is going on. Lastly, the effect of despondency and anxiety in *predisposing* to disease is too well known to require notice.

But it is not merely as an exciting cause of disease that excessive exertion of body or mind is deserving of notice. It is also a *predisposing* cause. Notwithstanding that exercise moderate in degree strengthens both body and mind, it has an opposite effect when either too long continued or out of proportion to the strength of the individual. The animal functions are depressed; the muscular tissue loses its tone; the circulation of the blood is feebly carried on, and the nutritive function impaired. The strength is reduced and nervous excitability takes the place of it. This is a condition in which *all* the exciting causes of diseases are unusually operative. If necessary, many proofs of the predisposition caused by fatigue might be adduced from the occurrence of epidemics and other severe forms of disease amongst soldiers, after long marches, during the campaigns which have hitherto been so frequent in India. The fact is equally well shown in civil life. It has been demonstrated, that the mortality amongst a given number of men is proportioned to the demand made upon the nervous and muscular systems.

Exercise of body or mind defective.—Want of exercise of body or mind directly and indirectly produces disease, by favouring internal congestions and diminishing excretions, thus leading to derangement of the digestive organs and plethora, and the development of fat. Some organs appear to suffer more than others; the liver, from having to excrete a part of the hydro-carbon which would have been thrown off by the lungs under active exercise, and the brain, from accumulation of blood in consequence of the circulation being feeble in the more distant parts. But it is in causing loss of tone in the muscular system, and consequently sluggish performance of the various functions, that want of sufficient exercise is so injurious.

When muscular exertion is not so sudden and violent as to cause immediate injury, and is yet out of proportion to the strength of the individual and long continued, it may cause death by exhaustion or syncope. In a less degree it leads to great weakness of the muscles and depression of all the functions, including those of assimilation and excretion. The blood becomes charged with effete matters from the waste of tissue, and which are insufficiently eliminated, in consequence of the depressed condition of the excretory function.

CHAPTER II.

CAUSES OF DISEASE—*(continued).*

Intemperance in the use of spirituous liquors.—When alcoholic or fermented liquors are taken in small quantities along with food, they improve the appetite and perhaps the digestive power of the stomach, and on this account are sometimes used with advantage by weakly and delicate persons. By reason of their power of diminishing the decay or waste of tissue, they are also very serviceable in exhausting diseases. But when habitually used, even in small quantities by persons in robust health, they tend to the production of a plethoric condition, in which there is an excess of blood imperfectly assimilated, the impurity of which is still further added to, in consequence of diminished elimination of carbonic acid by the lungs, and secretion from the kidney. It is not surprising, therefore, that free livers should be liable to cutaneous eruptions, hæmorrhages, dyspeptic derangements, and other functional disorders.

When alcohol is taken in large quantity, it acts as a narcotic poison, producing cerebral excitement, followed by insensibility, coma, and in some cases death. In smaller quantity, and frequently taken, alochol causes the disease known as "delirium tremens" It has been proved by experiment and morbid anatomy, that when alcohol has been largely taken, it exists in appreciable quantity in the nervous tissue.

Alcoholic liquors, in quantities which although insufficient to produce the serious derangements just noticed, and yet in considerable excess, exercise a very prejudicial influence upon various textures and organs. The nervous system is out of all proportion the most, and the alimentry canal the least, frequently affected. The lungs, liver, heart, and arteries suffer in the order of frequency now stated.

The effect of alcohol in the stomach is to coagulate, and thus impede the solution of the albuminous constituents of the food. It also over-excites by its irritant properties the glandular secretions of the mucous membrane, and produces more or less permanent congestion. Received into the blood by absorption through the veins, it stimulates and excites every organ to which it is conveyed. The most notable influence is upon the brain, the functions of which at first merely excited, are afterwards perverted and even suspended. The liver and kidney are goaded to increased action ; the former chiefly as respects its power of forming sugar, the latter in regard to its own peculiar secretion, the urine. The more remote effects of intemperance are scarcely less constant and striking. The functions of the stomach are deranged, as evinced by a voracious or defective appetite, vomiting, water-brash, heart-burn, gaseous distension, and constipation of the bowels. The circulation of the blood is retarded, and particularly in the lungs. Hence congestion of the pulmonary capillaries, causing hurried and difficult breathing, and that short dry cough which is almost general in spirit drinkers. Passing by means of the portal system at once into the liver, the function and structure of that organ are deranged. Mixing with the blood, and being inassimilable, it can only be got rid of by excretion, and as the kidneys are the chief organs by which this is effected, they also often suffer, at first by over-excitement, afterwards by depression. Acting upon the nervous system, it produces headache, lassitude, despondency, and even mental derangement.

But it is not alone the diseases which are immediately excited by intemperance that makes the indulgence in spirituous liquors so injurious. It is rather the predisposition, afforded by the state they occasion, to all the exciting causes of disease. During inebriation, alterations of temperature, endemic, epidemic, and contagious influences are in an unusual degree operative; and that state of debility or anæmia which the long-continued use of spirituous liquors never fails to produce, *predisposes* more or less to all diseases.

Excessive evacuations.—The sudden discharge of a large quantity of blood causes death by syncope ; a similar result may follow a profuse secretion, as in the serous diarrhœa of young children, or in the purging from drastic purgatives in persons who have been previously weakened. The possibility of such an occurrence must always be kept in mind in the use of active purgatives amongst the ill-fed classes in the large towns of India. But it is not alone the immediate effects of excessive evacuation that are to be dreaded. It is rather the cachectic and anæmic condition which is invariably produced by their frequent repetition, which tends so much to the occurrence of disease. For not only by such discharges is the quantity of the blood reduced (anæmia), but it is also altered in its quality (cachexia). All the vital functions are depressed, and the "vis medicatrix,"—the capability of resisting the exciting causes of disease, is in a great degree lost.

The evacuations which most frequently occur are hæmorrhages from the rectum or uterus—*hæmorrhoids, menorrhagia*—discharges from mucous surfaces,—*diarrhœa, leucorrhœa, broncorrhœa*—profuse glandular secretions,—*sweating, spermatorrhœa, diabetes*, &c.

Defective evacuations and secretions.—The retention of excrementitious matters in their receptacles, as for example of the fœces and urine in the large intestines and bladder is injurious. The more fluid portion of the feculence being reabsorbed, contaminates the blood, whilst the hard scybalous residuum being retained in folds of the mucous membrane, causes colic, diarrhœa, or even inflammation and ulceration. The urine accumulating in the bladder over-distends that organ, exciting inflammation and sometimes causing rupture. But this even is not the worst, for a portion of the fluid being reabsorbed, the blood is poisoned. In extreme cases typhoid symptoms set in, followed in some instance by delirium, coma, and death. In such cases urea is found in the serous effusions, which are common in the brain and other situations.

But the evil consequences of deficient evacuations are best seen when the secretions are not only retained but suppressed. Then noxious matters accumulate in the blood and act as poisons. The rapidity with which death is produced in such cases, is determined by the waste of tissue which is taking place. Suspension of the function of the kidneys in a robust individual, previously in health, is fatal in 48 hours; whereas in epidemic cholera, where the nutritive processes are at a very low ebb, no urine may be passed for several days, without the symptoms of blood contamination being evolved. Sudden suppression of the secretion of the skin is a well known cause of many febrile and rheumatic attacks. In a minor degree, defective excretion at first leads to fulness of the vessels, but afterwards to cachexia and anæmia. This is very apparent in diseases of the liver and kidney, which interfere with the secretion of bile and urine, and still more notably in those uterine and other derangements which diminish the menstrual discharge. But it is not alone the suppression of natural discharges which is hurtful; those artificially set up,—a seton, issue, &c.,—cannot be suddenly stopped with impunity. In many instances very serious consequences have followed when a seton or issue has been allowed to heal. So great is the risk thus incurred, that some Physicians of experience are on this account alone deterred from the use of such remedies. In like manner, discharges which, though abnormal, have become more or less habitual, should be suppressed with much caution. Thus, the cure of hæmorrhoids, of bleeding from the nose, and of a long standing diarrhœa, has been followed by the most serious disease.

Unhealthy occupations.—Some occupations are unhealthy from the violent muscular exertion that they involve; others from the work being carried on in houses where the air is rendered impure, on account of the number of persons employed. But there are occupations which in their very nature are hurtful. Persons who are engaged in dressing stones, or in pointing needles, often suffer from pulmonary disease, and others, whose employment is the manufacture of lucifer matches, are affected with necrosis of the maxillary bones. Moreover, all sedentary employments are in a greater or less degree injurious, as interfering with digestion and the nutritive function.

Previous disease.—The debility which follows an attack of any serious malady, gives a susceptibility to the action of the exciting causes of disease. Care should therefore be taken to guard, during convalescence and until the strength is restored, against exposure to cold, irregularities in diet, unusual exertion, mental excitement, and the like. Neglect of such precautions is often the cause of a relapse of the former malady, or of the occurrence of a new and perhaps more serious affection. There is in this country abundant proof of the effect of previous disease in the great prevalence of dysentery during the cold months of the year, in bodies of men who had suffered from malarious fevers in the autumnal months. The fact of the predisposition thus afforded, should be borne in mind in moving persons who have suffered in an unhealthy climate to a climate which, though more healthy, is colder. The cold acts upon men thus debilitated as a most efficient cause of dysentery and other serious diseases. The want of due appreciation of this fact has led at times to considerable mortality; and especially in the removal, without sufficient care, of soldiers weakened by previous disease to the sanitaria of the hill stations of India.

Previous disease seems also to favour the occurrence of disease, independently of its effect in causing debility. For example, a child that has had croup is very liable to a subsequent attack, and so also is a person who has once had enteritis. The greater number of the convulsive diseases, chorea, epilepsy, &c., exhibit a sort of habit of recurrence, and one which it is often very difficult to break or remove.

Over-crowding and want of ventilation.—The atmosphere surrounding a living animal becomes contaminated by the exhalations from the lungs and skin, which, besides containing a large amount of carbonic acid gas, are composed of watery vapour and various saline and organic matters. Mixing with the atmosphere, they occupy the place of its constituent gases, and thus lead to a diminution in the proportion of oxygen, whilst some of these exhalations when inhaled, exercise a poisonous influence. It has been estimated, that each individual vitiates by respiration 400 cubic inches of air in a minute, and by pulmonary and cutaneous transpiration 3 cubic feet.

Want of cleanliness.—Want of attention to ablution and change of clothing leads to the accumulation on the surface of the body of the sweat and sebaceous secretion, mixed with dust and sand, and other extraneous matters which float in the air. In this way the pores of the skin are blocked up, and the secretion from the sudoriferous glands is impeded. Noxious matters accumulate in the blood and contaminate that fluid. Moreover, the filth just noticed forms a nidus for the development of parasites, and thus lays the foundation for the cutaneous diseases that are caused by them.

Customs and habits.—There can be no doubt that there are many customs and prejudices more or less prevalent in all classes in India, and related to caste feeling, which are productive of disease. This subject has not been sufficiently investigated, and no more will be attempted than to allude to a few of the most common amongst Hindoos and Mussulmen. Long fasts are common, sometimes complete for a day or two, and partial for many days or even weeks. They are often religious observances, but not unfrequently, and especially in females, the result of vows. The evils caused by pilgrimages have been already noticed, and it is certain that there is no more fertile cause of epidemic and contagious diseases. The practice of early marriages amongst certain classes cannot fail to be injurious. The consummation of marriage in all castes is seldom delayed beyond puberty, and in some precedes it. Girls bear children long before they have attained full growth. Uterine disease, general weakness, and premature old age are often thus produced. The prohibition amongst Hindoos of the re-marriage of widows, and the custom of infant marriage, lead to frequent instances of old men being married to very young girls, and to much social and physical misery. The prejudices connected with menstruation are very hurtful. Hindoo women during this period are often insufficiently clothed, and are made to lie on the ground. Parsee women are placed in the worst and darkest room of the house, where they have to remain until every sign of menstruation has ceased.

But it is almost impossible to exaggerate the evils which result from the management of women in the parturient state. The close, dark, and badly-ventilated rooms in which they are kept—sometimes for forty or even more days—their segregation from their families during the whole of this time, the irrational manner in which their diet is regulated, and many other practices which might be mentioned, cannot fail in many instances to produce the most serious results.

Temperament and age.—Four conditions of the system are recognised as temperaments, and called *sanguine*, *phlegmatic*, *bilious* or *melancholic*, and *nervous*. In the *sanguine temperament*, as might be expected, the circulation of the blood is active, and there is an abundance of the red corpuscules. We recognise it by the pulse being easily excited, the face somewhat flushed, and the mind lively and active. It is said to give a predisposition to inflammatory diseases and hæmorrhages.

The *phlegmatic temperament* is characterised by a weak pulse, cold extremities, and a pallid appearance of the skin. The intellect is slow, and all the actions are sluggish. Watery fluxes and dropsy are perhaps more common in persons of this temperament than in others.

The *bilious* or *melancholic temperament* is distinguished by the complexion being dark, and the temper or disposition of the person gloomy. It is believed to give a predisposition to diseases of the liver and of the digestive organs. In the *nervous temperament* there is unusual excitability and agitation of manner, and the frequent occurrence of nervous derangements, as hysteria, spasms, pains, &c.

Without denying the influence of temperament, it is probable that too much weight has been given to it. At all events, it must not for a moment be supposed that there are special diseases restricted to each variety. Nor should it be overlooked that it is rare to meet with these temperaments uncombined; two or more being usually associated together in the same individual.

The effect of *age* in predisposing to certain diseases is undoubted. During infancy there is much susceptibility to cold, and consequently to the visceral diseases that are thereby induced. Diseases of the skin are common, doubtless on account of the delicacy of that structure. The mucous membrane of the intestinal canal is very prone to be irritated by food. The period of dentition is attended with many dangers; the nervous system, bowels, and air passages being often disordered. The period of puberty, especially in the female sex, gives a susceptibility to diseases of the circulation and nervous system. In advanced age the circulation of the blood is enfeebled, and very often fatty and calcareous matter is deposited in place of the normal textures. Hence congestions of blood, rupture of blood vessels, and the serious consequences resulting from them; but every function is weakened in consequence of the gradual failure of nutrition.

SECTION III.

HYGIENICS, OR THE PREVENTION OF DISEASE.

The prevention of disease is either the removal of the causes which produce it, or the use of an antidote, as vaccination. Many diseases once excited being incurable, it is manifestly of great importance that their occurrence should be prevented. Since attention has been given to this object, the value of life has generally increased; some serious maladies have become less frequent and severe, and a few have altogether disappeared.

If *all* the causes of disease were ascertained and were susceptible of being removed, Hygienics would take the place of Pathology and Therapeutics. But obvious as are the advantages of its study, the difficulties in the way of prosecuting Hygienics as a practical science are very considerable. Many causes of disease are unknown, and of those that are known, not a few are so related to occupations, social customs, and in India to religious observances, that it is at present impossible to prevent their operation. It is the duty of the medical practitioner to set the true nature of such causes before the public and the Government, leaving their removal to be effected by the gradual progress of enlightenment and a wise and cautious legislation. In treating of the causes of disease in the preceding section, much of what might have been placed under Hygienics has already been discussed, and as the prevention of particular diseases (prophylaxis) can be most conveniently considered in Special Pathology, the remarks in this section will be very brief.

Hygienics may be divided into—1*st*, General Hygiene, or the adoption of measures for the prevention of disease amongst large numbers of persons or in communities; 2*nd*, Special Hygiene, or the adoption of measures for the prevention of disease in families or individuals.

CHAPTER I.

GENERAL OR PUBLIC HYGIENE.

The circumstances which mainly affect the health of the inhabitants of towns, camps, &c., have reference to *sewerage and draining, burial grounds, sites of houses, and arrangement of streets, mode of construction of houses, markets, water supply, &c.* A few brief remarks will be made under each of these heads.

Sewerage.—By sewerage is to be understood the removal of excretions and other organic matters, whether vegetable or animal. This can only be satisfactorily effected by a system of drainage. The drains must be of sufficient size, have the requisite fall, and be so constructed, that they can be frequently flushed by allowing water to run through them. They should be covered and surrounded by material which is not porous, so as to prevent leakage. Great care must be taken that the large sewers are connected with covered drains from each house. The prevention of deleterious exhalations from drains and sewers may be facilitated by the use of disinfectants. The disinfectants most commonly employed are chlorine, charcoal, nitric acid, chloride of zinc, permanganates of potass and soda, and carbolic acid. Chlorine acts in virtue of its affinity for hydrogen, combining with which it forms hydro-chloric acid, and thus breaks up the complex organic compounds that are with good reason supposed to be noxious. It may be applied, by exposing to the air chloride of lime either alone or mixed with water, or by mixing together black oxide of manganese and hydro-chloric acid. In tropical countries, chloride of lime so soon spoils, that it can scarcely be used as a disinfectant.

Charcoal is a disinfectant in two ways:—1*st*, by its property of absorbing gases; 2*nd*, by its catalytic power of causing the oxydation of organic liquids and gases. So porous is this substance, that a square inch has been found to expose by means of its pores, a surface of 73 square feet. Into these pores organic liquids or gases are received, and meeting with oxygen from the air, which had been previously absorbed, that form of catalysis called "surface action" takes place, which results in the oxydation and destruction of the organic liquid or gas.

The vapour of nitric acid is a powerfully oxydising agent, tending by its affinity for hydrogen to decompose organic gases, and convert them into binary compounds, such as water. This disinfectant may be used by heating common nitric acid in a room, or by acting upon nitrate of potash with oil of vitriol.

The disinfectants above noticed have of late been almost superseded by the chloride of zinc, the permanganates of potass and soda, and carbolic acid. The chloride of zinc, in addition to the action of its chlorine, affords a base in the zinc it contains for combination with sulphur, which is so common a constituent of exhalations from decomposing organic matters.

Permanganate of potass is a powerfully oxydising agent, almost rivalling ozone. Carbolic acid, on the other hand, is an antiseptic, and therefore serviceable in preventing decomposition rather than in neutralizing or destroying the products of it.

In many parts of India sewerage is neglected. Most of the drains are uncovered, and are not constructed upon any systematic plan. The sweepings, filth, &c., from each house are often thrown into the street and not removed.

Drainage and cultivation.—Necessary as a system of sewerage is, good drainage, especially in tropical countries, is of equal or even greater importance. Surface water should never be allowed to accumulate, and if possible, the ground surrounding the town should be cultivated. There is no better established fact, than that a high state of cultivation prevents the production of malaria. But the drainage must be perfect; when it is incomplete, the surface of the ground is moist, and this is the condition the most favourable for the generation of malaria.

Burial places.—There can be no doubt, that the burial of the dead in the midst of a living population is prejudicial to health. Burial places should therefore be in the suburbs, or even outside of all large towns. It would be well, also, that they should be in the direction opposite to that of the prevailing winds. The graves must be of sufficient depth, never less than six feet from the surface, and extreme care should be taken to prevent the drainage from burial places flowing into tanks of drinking water. There is abundant evidence, that water in this way rendered impure, is in the highest degree injurious. The disposal of the dead in India, except amongst the classes in which cremation is practised, is open to great objection. Dead bodies are sometimes left exposed,—as on the banks of sacred rivers,—and when placed in the ground, are laid in graves scarcely a foot from the surface.

Sites of houses and arrangement of streets.—The houses and streets should be so arranged as to admit of free ventilation and to ensure an abundant supply of water. This is of especial importance in tropical countries. The streets should be straight, at right angles with one another, of sufficient width, and paved. Water should be procured from a tank or reservoir considerably elevated above the town, so that each house may be supplied even in the upper story. The construction of houses is of great importance in a sanitary point of view, but it is little attended to. Houses should be well raised—upper-storied are the best,—and should face the prevailing wind. The rooms should be lofty and well ventilated by windows opposite to one another. In size they should be adapted to the number of the occupants.

In India it often falls to the medical practitioner to select the site for pitching a camp or forming a cantonment. The ground should be elevated and open to a free current of air; and the soil dry and free from underwood. A clay soil is always objectionable, on account of its retaining moisture. The camp should not be in the vicinity of a marsh, nor of low-lying jungles. The low marshy banks of rivers and valleys, or deep gorges between hills, are especially to be avoided. Care should be taken that the ground is capable of being properly drained; a loose gravelly soil upon the side of a sloping hill is generally well suited for a camp. Ground which has only a short time before been encamped upon should be avoided. If it should be necessary to pitch the camp near to a marsh or jungle, the windward side must always be selected. The tents should not be too close together, and great attention should be paid to cleanliness.

Water supply.—The health of bodies of men, whether in towns or camps, is greatly influenced by the supply of water. It is well known, that the use of water which contains decomposing organic matters is very prejudicial, and there is ground for believing, that the common cause of fever in tropical climates —malaria—may be introduced into the system along with the water that is drunk. Water for drinking should not contain above $\frac{1}{20}$ per cent. of saline matters, and should be quite free from organic impurities. It should, as before mentioned, be procured from a tank or reservoir at a distance, streams of water or tanks in the town being liable to be polluted.

Markets.—Not only is it necessary that markets should be established for the sale of articles of food, but measures should be adopted to ensure the food being of good quality and unadulterated. This is of much importance. Articles of food are sometimes accidentally mixed with matters which either render them hurtful, or diminish their alimentary value; but more frequently such adulterations are wilful, and practised for the purposes of gain. Inquiries have been instituted within the last few years in England, in order to ascertain the extent and nature of the adulterations practised in that country, and it is very desirable that a similar inquiry should be set on foot in India. In some of the large towns (Bombay for example), an officer is appointed to inspect the markets, who is responsible for their being kept clean, and is bound to bring to the notice of the Police any articles exposed for sale, which, in his opinion, are unfit for human food. His qualifications do not extend much beyond the capability of distinguishing between wholesome meat and that which is diseased or putrid. In India, where the staple article of food is grain, it is very desirable that some regular and systematic examination of its quality should be established.

Tanks and bathing places.—Every facility should be afforded for washing purposes. Tanks of easy access, in sufficient numbers, should be constructed and kept nearly full of water. They ought to be separate from those in which clothes are washed. Stringent rules must be enforced to prevent dead animals or offal being thrown into them, and if practicable, the water should from time to time be renewed.

Such are a few of the general sanitary measures which are calculated to prevent disease in a community. To enter more fully into the subject would be beyond the limits of this work.

CHAPTER II.

SPECIAL HYGIENE.

ALTHOUGH the health of a community is influenced by sanitary regulations enforced by authority, the health of an individual mainly depends upon himself. By watchful attention to the circumstances in which he is placed, he is frequently able to escape sickness during the greater part of his life.

Food.—There is nothing which conduces more to the maintenance of health than proper regulation of the food. As regards quantity, it should be adapted to the wants of the system: for example, persons engaged in severe mental or bodily exertion require more food than others who are not so employed. No fixed rule as to quantity can be laid down; the appetite is the best guide with the understanding that repletion is to be avoided (page 94). Attention should be paid to cooking, as thereby articles of food are rendered more digestible, in addition to which the heat that is employed destroys the sporules, ova, and early stage of development of various parasites. The art of cookery is but little understood or practised in India by the natives, and it may be stated generally, that in the diet of all classes there is too much sameness. Food should be taken at fixed times, not too wide apart, and never when the body is much fatigued. After a full meal, active exercise is to be avoided for an hour or two. There is a prejudice amongst English people against indulging in sleep during the first stage of digestion, but it is probably not well founded. If we may judge from the drowsy feelings which all persons experience after eating, and the instincts of animals, sleep would appear to follow a full meal almost as a matter of course. Great injury to digestion often results from the food being insufficiently masticated. In addition to quantity, it is requisite that food should contain a due proportion of certain constituents (page 94). It is very much to be regretted that we do not possess any full and satisfactory information as to the alimentary value of the various grains used by the people in different parts of India. In the absence of this, a few general facts regarding the kind of food used by different classes may perhaps be usefully stated.

Hindoos.—The Hindoos, with respect to food, may be divided into those who do, and those who do not, make use of animal food. The latter are chiefly Brahmins and Bunneas, and of the former, many restrict themselves to fish. The classes who use animal food are not meat-eaters in the sense that Europeans are. They do not make animal food a considerable or main part of their diet, but rather take it as a sort of condiment, to render other food more palatable. Of the higher classes, rice may be considered as the staple article of food, although there is some difference in this respect in different parts of the country. The lower classes are not generally speaking able to procure rice, and are obliged to substitute grain, of which there are many varieties. Many of these grains are of little nutritive value, and insufficient to maintain health. Those who consume rice largely also use dhall, which contains a much larger proportion of nitrogen. Ghee and vegetables are used by all classes, but the latter are often of little alimentary value. Milk is freely consumed by those castes to whom animal food is forbidden. Upon special occasions—as festivals—which are numerous, sweetmeats and fruit are very generally eaten. The quantity of solid food daily consumed by a healthy adult of active habits is from about 50 to 100 tolas (18 to 40 oz). Most Hindoos eat twice in the day, viz. about 11 A.M. and 8 P.M., but labourers and artizans are obliged to vary the hours according to their occupation. Children have usually three meals, and so also have some of the lower classes.

As regards the use of alcoholic liquors, it cannot be said that they are at all generally indulged in. Some of the lower classes drink to excess, and sometimes to great excess, but on the whole inebriety is not common. The same, however, cannot be said of the use of narcotic drugs, as opium, bhang, tobacco, &c. There are no classes, and but few individuals, who wholly abstain from them. It is a question for future investigation, whether or not the cachexia caused by narcotics is analogous to that from spirit-drinking, as regards its relation to the exciting causes of disease. The habitual drunkard and the opium debauché do not differ much in outward appearance, nor in their state of mental degradation, and when severe disease has occurred, the tendency in each is exhibited towards a fatal termination. It is more than probable therefore, that diseases which have been traced to the excessive use of alcoholic liquors, have a similar relation to the abuse of narcotic drugs.

There can be little doubt, that the food of the lower classes of Hindoos is often insufficiently nutritious, a state of more or less asthenia being in consequence very prevalent amongst them.

Mussulmen.—Amongst Mussulmen the diet is less bulky, but more nutritious than in Hindoos. More animal food is taken, and less dependence is placed on rice as the staple article. The number of meals in the day is usually three, the first or morning meal being restricted to bread and milk, or cream and congee.

In the diet of the Parsees there is no peculiarity requiring special notice. Amongst the higher classes, as amongst Hindoos, rice is the main article of food, but they partake more largely than Hindoos do of animal food. The lower classes are not always able to procure meat, and are often restricted to an inferior kind of fish. The number of substantial meals amongst the Parsees is two, but a light breakfast is sometimes taken early in the morning.

The subject of native dietetics in India has never been investigated in regard to its bearing upon health and disease. An elaborate account of the diet of various castes, coupled with the nutritive value of different articles, is a desideratum.

Clothing.—Clothing is much neglected by the natives of India; it is not adapted to the seasons of the year, nor to the varying temperature of the day and night. This is particularly the case in children, and especially amongst the lower classes, children under seven or eight years of age being quite naked. The best material for clothing is that which has a low power of conducting heat; flannel and woollen clothes are the most suitable. The body may be protected from wet by the outer clothing being composed of a material which is impervious to fluids. Should the clothing next the skin become wet, it must be at once removed. Children require to be warmly clad, owing to their defective power of generating animal heat. In most countries, attention has to be chiefly directed to protection from cold, but in tropical climates we have also to consider the means of guarding against intense heat. Bad conductors of heat are equally suitable for preventing the body from being unduly heated, as they are for preventing it from being unduly cooled. The colour of the clothes should be white, as being less absorbent than other colours, and they should be loosely fitting. The head must be well protected, and there is much advantage in wearing several folds of cloth as a cummerbund around the loins and abdomen.

Air and exercise.—Nothing is more conducive to health than free exercise in the open air. This should, however, fall short of fatigue. For strong and robust persons no exercise can be better than walking ; for others horse exercise, and for the very delicate, gestation in a carriage may be preferable. The health of young people is often rendered vigorous by engaging in various out-of-door amusements, as cricket, and other games of an active kind.

Gymnastic exercises are also useful, as favouring the growth and development of the frame, but they must be practised with caution, and are adapted only to the periods of youth and early adolescence. The extent to which they may be safely carried is to be determined by habitude and the natural strength of the individual ; also in part by the nature of the climate in which he lives. In cold countries they may be indulged in to a greater extent than within the tropics, but the difference in this respect is not so great as has been and is supposed. Persons in India, who from their occupation are habituated to muscular exertion at an early age, are capable of performing feats of strength, and of sustaining continued muscular exercise, to a degree that would bear close comparison with the exploits of the inhabitants of extra-tropical countries. That at the present time there is, as a general rule, a vast difference in physical strength between the natives of temperate and tropical countries, does not admit of doubt, but this is probably more due to difference of habits than of climate. Amongst the Hindoos and Mussulmen, taken as a body, manly exercises are discouraged, as opposed to custom, and inconsistent with social and even religious observances. But amongst Parsees, where similar prejudices do not exist, English games requiring strength and activity are rapidly gaining ground, and it is probable that future generations of this enterprising race will not, as regards physical development, fall far short of their European brethren.

Exercise is most beneficial when the air is dry. Such air has a tonic influence, and sometimes this may be so great as to cause discomfort in plethoric persons. Moist air, if at the same time warm, is relaxing; and if cold, apt to produce congestions and inflammations. The latter condition of the air may be remedied by artificial heat, ventilation, &c.

The great importance of pure air cannot be over-estimated. This is to be obtained by a suitable locality of residence, by avoiding over-crowding, by securing free ventilation, by attention to drainage, &c. Where circumstances are unfavourable, the air may be rendered more pure by the use of disinfectants.

Exercise, as such, can scarcely be said to be taken by many classes of the people in India. The occupations of most men, it is true, bring them out of their houses during some part of the day, but however short may be the distance they have to travel, they seldom walk if their circumstances will permit them to use a vehicle. Females, for the most part, are from custom and prejudice precluded from exercise of every kind, and even school boys do not often engage in those sports which, amongst English lads, are so conducive to health and strength.

Attention to cleanliness.—It is difficult to exaggerate the importance of cleanliness. The whole body should be washed daily, and frictions freely used. Cold water is better for most persons than warm, but delicate people do not always bear cold bathing. If after leaving the bath there should be a feeling of chilliness, tepid should be substituted for cold water. We might suppose, from the frequent ablutions which are enjoined by the religious codes of Eastern nations, that want of cleanliness would not be a common cause of disease in India. Such ablutions are, however, often more ceremonial than real, and are compatible with the practice of wearing dirty clothes, and living in houses where filth of almost every kind is allowed to accumulate. There is, moreover, a prejudice amongst natives, which appears to be almost universal, that in diseases which are attended with fever, washing is very prejudicial. Hence, it is not uncommon to see persons, even amongst the higher classes, who have ignored the external application of water for many weeks or even months.

There are yet other circumstances which are of importance in maintaining health. The regulation of the mind, and its employment upon matters of sufficient interest, which are not at the same time too exciting; the control of its various emotions and passions; abstinence from excessive sensual indulgences; the apportionment of sufficient part of the twenty-four hours to sleep, may be mentioned as examples. These are matters which each individual must settle for himself; their discussion would not therefore be profitable, even if space were sufficient.

SECTION IV.

THERAPEUTICS, OR THE CURE OF DISEASE.

THE science of Therapeutics relates to the cure or relief of disease. It may be studied in two ways :—1*st*, classes of remedial agents may be examined as they affect the various functions; 2*nd*, a single remedy may be examined as it affects a particular disease. This has led to the division of therapeutics into *general* and *special;* the former will chiefly engage our attention in this place, the latter being treated of in Materia Medica and the Practice of Medicine.

There is, as is well known, a tendency in almost all diseases, to the setting up of those processes which bring about a restoration to health; and, consequently, curative measures should be solely employed for the purpose of aiding this tendency. In some cases interference may be unnecessary or even hurtful, but in most instances recovery is hastened by suitable medical treatment.

By therapeutic means or agents we understand modifications of the vital stimuli, *i. e.*, food, air, and light; and certain external agents which are the articles of the Materia Medica, and familiarly known as medicines, drugs, or remedies.

As a general rule, from which there are few exceptions, medicines do not act unless they are received into the blood. There are various channels through which they may reach that fluid. The greater number are introduced into the stomach and intestinal canal, and are absorbed by the veins there situated. When in a state of gas or vapour, they are taken into the lungs during respiration, and now and then, medicines both fluid, solid, and gaseous are applied to the skin, either before or after the cuticle has been removed. Of late years some remedies have occasionally been injected into the subcutaneous areolar tissue; and in a few instances they have been directly injected into veins. As through most of the channels mentioned the medicine reaches the blood by endosmosis, it must be in a state of solution or a gas. It is ascertained, that the greater number of medicines are soluble either in water, an acid, or an alkaline solution. All these fluids exist in the alimentary canal.

The means that are employed in treating disease, have for the most part an action upon one or more of the great functions, and it is therefore possible to arrange them in classes.*

1*st.* Remedies which influence the circulation of the blood.
2*nd.* Ditto ditto the nervous function.
3*rd.* Ditto ditto the secretions.
4*th.* Ditto ditto the muscular tissue.
5*th.* Ditto which act mechanically or chemically.

CHAPTER I.

REMEDIES WHICH INFLUENCE THE CIRCULATION OF THE BLOOD AND THE BLOOD ITSELF.

THE remedies which influence the circulation of the blood, are of all perhaps the most important. Their action is either upon the heart, upon the capillary circulation, or upon the blood. But inasmuch as the circulation of the blood, and the condition of the blood are intimately related, it is not always possible to separate the action of these two classes of remedies.

REMEDIES WHICH HAVE A SEDATIVE OR DEPRESSING INFLUENCE ON THE HEART.

Antiphlogistic regimen.—The action of the heart is depressed by abstinence from food, and from all sources of excitement.

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* It must be understood, that many medicines act upon more than one function, and that some influence a function through their action upon another function; thus, certain remedies depress the function of the nervous system, and secondarily, on account of this, the action of the heart.

By strict antiphlogistic regimen is understood a diet consisting of a few spoonfuls of congee at intervals of three or four hours; restriction to the recumbent posture, in a room somewhat darkened, but well ventilated; the utmost quietude, and the absence of all exciting conversation.

The conditions in which this regimen is called for, are the early stages of inflammation, attended with sthenic or sympathetic inflammatory fever, and certain forms of idiopathic fever, which are of an inflammatory nature. It must, however, be continued for a short time only, should be used with caution in infants, and not strictly enforced in females or old persons.

In the treatment of most inflammatory diseases, a modified antiphlogistic regimen is usually adopted. All stimulating or highly nutritious food is excluded, and the diet is restricted to farinaceous articles, but they are permitted to be taken in larger quantities than would be proper if a strict antiphlogistic regimen were indicated.

Blood-letting.—The most direct and effectual means of depressing the heart's action, is by the abstraction of blood. The stimulus to the contraction of the heart is by this means rapidly diminished, but in addition nervous power is lessened. Thus, when a person is bled in the erect posture, the action of the heart is much more depressed by the removal of a given quantity of blood, than it would be if he had been bled in the recumbent posture. The explanation of this is, that the blood having to ascend against its own gravity, and the heart being enfeebled by the withdrawal of blood, the brain receives less than its usual supply, and in consequence its function is imperfectly performed. The heart, therefore, is in some degree deprived of nervous influence, and as the vigour of its action is related to this, it becomes depressed. Blood-letting thus acts in two ways, viz., by removing a portion of the stimulus, and reducing or depressing nervous power; the knowledge of the latter fact has a practical application. When it is desired to make a marked impression upon the circulation without the loss of much blood, the person is bled in the erect posture; when it seems rather desirable to take away a good deal of blood, he is bled in the recumbent posture. In the treatment of disease, blood-letting is also serviceable by causing derivation, and by favouring the absorption of medicines.

Blood may be drawn by opening a vein (*venesection*), or more gradually, by making a number of small openings ; the first is *general bleeding*, the last *local bleeding*,—so called because the blood is usually taken from the neighbourhood of the diseased part.

General bleeding.—The vein mostly selected for venesection or phlebotomy, is one at the bend of the arm—either the median basilic or cephalic. In young children the external jugular is sometimes opened, and occasionally in adults a branch of the temporal artery is divided. The quantity of blood that should be drawn, is to be determined by the pulse. When the pulse has become soft, its further abstraction should be discontinued. As a general rule, it is safer to bleed in the erect than in the recumbent posture.

General bleeding is proper in plethora with determination of blood to an important organ, as for example to the brain ; also in the first few hours of an attack of inflammation attended with sympathetic inflammatory fever—that is inflammation in a sthenic robust individual. Something will also depend upon the texture which is inflamed—inflammation in a serous membrane being more benefited by bleeding than in a mucous membranes.

On the other hand, it is not applicable to very young or very old persons, and must be adopted with much caution in females. Persons of irregular and dissipated habits in general bear blood-letting badly, and so do long residents in, or natives of, hot countries, as compared with the inhabitants of temperate climates. When bleeding is carried too far, the consequences are very serious. The patient may die of syncope ; should he recover from this, the reaction may assume what has been called "hæmorrhagic reaction" (page 36), a condition which is unfavourable for recovery from disease. But the most common of the ill effects of over bleeding, is a state of debility or anæmia, in which the processes that are requisite for the removal or organization of the inflammatory products, or the repair of loss or destruction of tissue, are very imperfectly carried on. Of late years, the practice of bleeding in most inflammatory diseases has been very much diminished, and there is a tendency to abridge it still more. Although, in the large Native hospital under my charge, I have not for some years prescribed general blood-letting, I am still fully impressed with the value of this remedy, provided that it be used, and *only* used in the cases which, on general principles, are suited to it.

Local bleeding.—Local bleeding is the abstraction of blood from the near neighbourhood of the inflamed or diseased part. In the treatment of acute inflammation, which has existed for several days, and from the beginning, when it is not acute, (or if acute has occurred in an individual who is not sthenic,) local is preferable to general bleeding.

Blood is usually drawn locally by the application of leeches or cupping, or by making scarifications with a lancet or sharp knife. It acts both by depletion and derivation; that is, it tends to reduce the quantity of the blood, and at the same time, by favouring determination to the part from which it is drawn, it derives from or diminishes the flow of blood to the part which is diseased. It is applicable to cases in which general bleeding is contra-indicated, or where, this having been employed, it is not thought proper to repeat it.

In young children it is perhaps the only safe way of abstracting blood, and must be used with much caution. Within the first year, the abstraction of from 1 to 2 ozs. would be equivalent to a full bleeding in an adult (from 18 to 20 ozs.). For each additional year of age half an ounce may be added.

As leeches are so much used, it is important that we should have some sort of idea of the quantity of blood each leech will draw. We can only arrive at an average, as much depends on the size of the leech and the quantity of blood that may flow after its removal. The Bombay leech is of small size, and does not take more than from one to two drachms of blood (including that which flows after its removal), whilst an English leech abstracts half an ounce. The Madras leeches are of large size. From experiment, it has been ascertained by Dr. Leith, Deputy Inspector General of Hospitals of the Bombay Army, that leeches in that Presidency draw a quantity of blood equal to about four times their weight, and that it is more satisfactory to order their application by weight than by number.* Thus, 1 oz. of leeches would abstract 4 ozs. of blood, and as it is calculated that each Bombay leech takes from 1 to 2 drachms, 16 leeches are equivalent to from ½ oz. to 1 oz. by weight.

Although local bleeding is useful when general bleeding is contra-indicated, it must not be supposed that it is proper in all inflammatory diseases. In weakly persons no blood should in any way be drawn.

Cold.—Cold has a very depressing influence upon the heart (page 97); indeed, in an extreme degree, and when long continued, it suspends the action of that organ. Used with caution it is often of much service; but in diseases of many internal organs it cannot be made applicable. Cold may be applied by means of ice, either natural or artificially prepared, or by evaporating fluids. To produce its good effects, the application must be continuous.

The sedative effects of cold are useful whenever there is marked vascular excitement; in states of depression it must be used with much caution. In inflammations within the chest and abdomen it is rarely used; in those within the head it is found to be very serviceable.

SEDATIVE MEDICINES.

Sedatives which act without evacuation.—These for the most part influence the circulation through the medium of the nervous system. They will be considered in the next chapter.†

Sedatives which act by evacuation.—Emetics.—In states of excited vascular action, emetics are used with two objects, viz., to unload the stomach and to produce an antiphlogistic effect.

When fever or inflammation occurs, the digestive processes are suspended; any food that may be in the stomach becomes irritating, and its ejection is therefore desirable. On this account the treatment of inflammation or fever is often commenced with an emetic. But emetics are also antiphlogistic remedies. During their action, the secretions from the skin and the mucous membranes of the mouth and stomach are increased, and thus to some extent they depress the heart, by diminishing the quantity of blood; but it is chiefly the nausea which accompanies their action that has such a depressing influence. It is also believed, that by the act of vomiting congestions are often relieved. The mode in which emetics act is not always the same: some are direct irritants to the mucous membrane of the stomach, cause little nausea, and are chiefly useful in emptying it; others produce their effects through the blood without being directly applied to the stomach, and if injected into the vessels of an extremity, will cause vomiting. Their action is attended with much nausea, and on this account they are generally selected when it is desired to produce a depressing effect. Emetics are useful at the very commencement of an attack of inflammation or fever, and especially when the tongue is thickly furred.

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* Transactions of Medical and Physical Society of Bombay.

† The few medicines which are believed to act *directly* upon the muscular fibre of the heart, are violent poisons, and seldom used as antiphlogistics.

When there is determination of blood to the brain, they must be used with much caution, lest the venous congestion which the act of vomiting occasions should prove dangerous. They should not be employed when there is much debility, nor, as a matter of course, when the lining membrane of the stomach is inflamed. They are not safe remedies in advanced pregnancy. Young children bear emetics well, provided that their action be quick. The depression caused by long continued nausea is sometimes dangerous in very young subjects. Depression of the heart's action may be kept up by the use of nauseants, of which antimony is the best. Nauseants act through the nervous system.

Cathartics.—Cathartics are powerfully depressing agents, acting indirectly by lessening the quantity of blood. They effect this by causing determination of blood to, and free secretion from, the intestinal mucous surface. They are also useful in unloading the intestines. With the object of depressing the action of the heart, they are used in inflammations and fevers, but they are also employed with other objects, as will be afterwards explained. When employed in the diseases above mentioned, it is usually in the early stages; but their use is not so much restricted to the very commencement of the attack, as that of emetics is. The cathartics which have a sedative action are those which increase secretion; others, which merely produce peristaltic action, have little effect in this respect.

Irritant cathartics must not be used when there is irritation or inflammation of the intestinal canal, nor when there is a proclivity to it, as is almost always the case when fever or inflammation occurs in asthenic persons. The poorer classes of the natives of India are not tolerant of active or irritant purgatives, which are apt to cause either general debility or inflammation of the intestinal mucous membrane. Cathartics may be freely given, with, of course, proper precautions to young children; but they must be less freely used in old persons and in females, especially during pregnancy and at the menstrual periods.

Diaphoretics.—Diaphoretics are medicines which promote secretion from the skin, and on this account are to a slight extent useful in depressing the action of the heart; but they are chiefly used in fevers and febrile states to diminish thirst and allay heat. It is only those diaphoretics which have at the same time a sedative action that are proper in these conditions.

Secretion from the skin may be promoted by the use of baths. Baths are of two kinds, viz., water baths and vapour baths.

Water baths.—Water baths differ according to the temperature of the water.

Tepid bath.—The tepid bath has a temperature of from 80° to 90° F. It is chiefly used to cleanse the skin and promote slight perspiration.

Warm bath.—The warm bath is of a temperature 10 degrees higher than the tepid bath, the water being raised to a heat of from 90° to 100° F. Its effects are very notable. It accelerates the pulse and respiration and increases perspiration, and afterwards causes languor, muscular weakness, and faintness. From its depressing effect upon the heart, it is sometimes of service along with other depressants in fevers and inflammations; but as its *first* action is to accelerate the pulse, it is not often employed in those conditions. The warm bath is more frequently used to allay spasm, as during the passage of biliary or renal calculi, or in the reduction of hernia. From the depressing properties of the warm bath, it must be prescribed with caution in weakly or asthenic states.

Hot bath.—The temperature of the hot bath is from 100° to 112° F. It is a very potent agent, and must be used with much caution. Its effect is that of an excitant; it accelerates the pulse and respiration, causes "violent throbbing, and a sensation of distension of the vessels of the head, with a feeling of suffocation and anxiety." The hot bath is not often employed, but has been of service in rheumatism and some chronic diseases.

Partial are sometimes preferable to general baths—as the *coxæluvium* or hip bath in some diseases of the abdominal and pelvic viscera; the *pediluvium* or foot bath in menstrual derangements, &c.

Vapour baths being used for the purpose of producing copious secretion from the skin, will be considered amongst the remedies which act upon the secretions. (Chap. III.)

The circulation of the blood, and the consequences of its derangement, are much modified by the state of the blood itself. The remedies which have the power of altering that fluid will now be considered. Before entering upon the class "hematics," it is practically useful to consider two medicines which as antiphlogistics are perhaps of all the most important, viz., mercury and antimony.

Mercury.—The physiological effects of mercury are as follows: the fibrin, albumen, and red corpuscules are diminished, and a very fetid matter, the result of decomposition, is present in large quantity. When drawn from the system, the blood coagulates with difficulty, and the clot is easily broken down. The blood being thus changed, nutrition is impaired, and the individual becomes thin and weak, or various constitutional derangements are set up (mercurial erethism, diseases of the skin, &c.). Sooner or later the mercury is excreted by the various emunctories; it has been found in the sweat, bile, urine, saliva, and fæces.

When elimination by the intestinal canal is prevented, mercury seeks exit through the salivary glands, producing increased secretion of saliva, and inflammation of those organs (Ptyalism). Ptyalism or salivation occurs at a variable period after a course of mercury has been commenced, much depending upon the constitution or peculiarity of the patient (idiosyncracy), and the nature of the disease for which the mercury is given. In weakly or cachectic individuals, ptyalism is often rapidly produced, and some persons, to appearance healthy, are so intolerant of mercury, that a few grains cause profuse salivation. In states of high febrile excitement, on the other hand, it is with difficulty that the mouth is made sore. When ptyalism is about to occur, the patient has a metallic taste in the mouth, and the saliva is increased. The gums, especially over the molar teeth, become tender, and afterwards swollen and spongy. The whole mouth is now sore and the teeth feel loose. The gums bleed on pressure, and the breath has an intolerable fetor. Should the medicine be continued, ulceration or even sloughing of the gums takes place; the tongue becomes much swollen, as well as the salivary and lymphatic glands of the neck; the teeth fall out, the alveoli are exposed, and in some instances exfoliate.

Treatment of salivation.—The degree of salivation which is ordinarily produced, requires no further treatment than a mild purgative, and some slightly astringent gargle. When more severe, leeches should be applied near the angle of the jaw, and more active purgatives given: should there be sloughing and intense fetor, gargles of chloride of soda or permanganate of soda should be used. After the sloughs have separated, the solution of the nitrate of silver is useful as an application to the ulcers that are left.

The action of mercury, when taken to the extent of producing slight ptyalism, is without doubt beneficial in certain inflammations in sthenic individuals, viz., in acute inflammations of serous and fibrous tissues. It depresses the action of the heart, by diminishing the constituents of the blood, and especially the red corpuscules, and thus lessens the tendency to fibrinous effusions. Moreover, by favouring those changes in coagulable lymph which are necessary to fit it for absorption, it assists in bringing about the removal of that which has been effused. In no case should the mercury be carried further than to produce slight tenderness of the gums; profuse salivation is always to be avoided.

Mercury acts also as an eliminant. During its excretion it increases all the secretions, and especially that of the liver and bowels.*

In large doses (grs. xx.), mercury has been thought to have a sedative action on the stomach, in virtue of which it is capable of allaying vomiting; but notwithstanding the evidence which is recorded in favour of this mode of action, there is ground for doubting it.

There are many conditions of the system which contra-indicate the use of mercury. It should not be given in asthenic states, and especially when they are associated with disease of the spleen or kidney; nor in the scorbutic and scrofulous diatheses. Whenever there is a tendency to irritation or inflammation of the gastro-intestinal mucous membrane, it must be used with much caution, if at all.

Antimony.—Antimony has much power in depressing the heart's action; at first by its nauseating properties, and afterwards by altering the blood. Being very readily absorbed, its action is in general speedily produced, and it is therefore useful in those inflammations which are rapid in their progress. It appears to act upon the blood in the same way as mercury does, viz., by diminishing the plastic elements, and it may be usefully given in cases where mercury is contra-indicated, or where an immediate effect is desirable. It is not, however, to be used when there is irritation of the intestinal canal, nor in very asthenic states; and it must be prescribed for young children with much caution.

There are many medicines that act upon the blood, and although they do not immediately affect its circulation, may yet be conveniently considered in this place.

They have been arranged in two classes, viz:—1*st,* medicines which restore to the blood something in which it is deficient; 2*nd,* medicines which alter the blood.

Of the former class, iron is perhaps the best example; but acids, certain alkalies, and even vegetable bitters may also be included.

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* I am not unaware that of late the cholagogue property of mercury has been called in question, but I do not consider the evidence adduced to be sufficient to settle the point.

Of this class, the chalybeates are the most useful medicines, their action being gradual and permanent. They seem to supply iron to the hematine—hence they are required in all those conditions in which the red corpuscules are deficient, *i. e.*, anæmia, chlorosis, &c. Acids are useful when there is an excess of alkali in the blood; this is believed to be the case in certain fevers (typhoid, yellow fever, &c.), and thus to explain the undoubted benefit of acidulated drinks in those diseases. When the urine is alkaline, it is so in some instances from containing an excess of alkali at the time of its secretion; acids are then serviceable.

Alkalies, on the other hand, are given whenever there is reason to believe that acid is in excess in the blood—as in lithic acid deposits in the urine, and when acid is too freely secreted into the stomach, &c. They also alter the blood, and in this point of view will be presently considered.

The vegetable bitters will be treated of under tonics.

The medicines which alter the blood are of great importance, but their exact mode of action is but imperfectly known. Two of the chief of these blood medicines, viz. mercury and antimony, have already been considered.

Alkalies and salines.—Alkalies and salines diminish the quantity of fibrin in the blood, as well as its coagulability, and are therefore useful, in moderately sthenic persons, in all those states in which this constituent is in excess—as in inflammations, rheumatism, &c. In asthenic persons they must be given with caution.

Alteratives.—Many medicines, when taken for a long time, are believed to effect a slow change in the blood, and thus to influence the nutritive processes. How much of their action is upon the blood, and how much upon the cells of the tissues, cannot be determined. Such medicines are classed as alteratives. A large proportion of the articles of the Materia Medica have an alterative action. Those most frequently used are the milder preparations of mercury, iodine and the haloid salts generally, alkalies in small doses, &c.

Specifics.—Some medicines, when received into the blood, gradually counteract the effects of special conditions of that fluid, and are thus curative in certain diseases. Colchicum in gout, mercury in syphilis, and lemon or lime juice in scurvy, may be mentioned as examples. As no satisfactory explanation can be given of the mode of action of this class of medicines, they are called *specifics*.

Antiperiodics.—Other medicines have an action in destroying or suspending the operation of a poison in the blood. The poison over which they have the most power, is that which is common in tropical countries, viz., malaria, and as the fevers which it causes usually assume a periodic character, these remedies are called *antiperiodics*.

The class of antiperiodics is of great importance in tropical countries, where the greater number of diseases exhibit a periodic tendency. Numerous medicines have from time to time been supposed and declared to have antiperiodic properties, but few have stood the test of long experience. Quinine is out of all proportion the most efficient medicine of this class, and next to it, but at a long distance, arsenic. Of the other periodics from vegetable bitters containing alkaloids, may be mentioned bebeerine and berberine; but as febrifuges they are greatly inferior to quinine. Of supposed antiperiodics, the vegetable astringents, opium, myrrh, camphor, alum, and hydrochlorate of ammonia are a few examples. Antiperiodic medicines should, of course, be given in the intervals between the attacks, and at such times as to permit of the whole quantity it is desired to introduce into the system being assimilated before the period of the expected attack or exacerbation.

CHAPTER II.

MEDICINES WHICH ACT UPON THE NERVOUS AND MUSCULAR TISSUE.

The functions of the nervous tissue may be modified by the state of the circulation of the blood; thus, they are exalted when the circulation is active, and depressed when it is sluggish.* So, also, the quality of the blood may exercise an influence, as is evidenced by the depression of nervous force, which is produced when blood, altered by the retention of excrementitious matters, circulates through the nervous centres.

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* The views which have been recently promulgated by Brown-Sequard, Radcliffe Hall, and others upon this point, seem to me to require confirmation.

The medicines which act directly upon the nervous tissue are absorbed into the blood, and it is not until they reach the nervous substance that their action is manifested. They may be arranged in three classes :—1*st*, *sedatives*, which depress nervous force ; 2*nd*, *stimulants*, which exalt nervous force ; 3*rd*, *narcotics*, which, partaking of the properties of the two first named classes, have also an influence on the mind.

Sedatives.—Sedatives are medicines which directly lower the function of the nervous system, and secondarily the action of the heart. They include some of the most virulent poisons. From their secondary effects upon the circulation, some sedatives are used in states of vascular excitement ; but as in adequate doses, their effects are not always certain, and are occasionally dangerous, they are not often employed.

Sedatives are of two kinds, *general* and *special.*

General sedatives.—General sedatives are those which act on all parts of the nervous centres, except that which is connected with the mind. Hydrocyanic acid, aconite, and colchicum are examples. They are useful in states of nervous excitability, and are occasionally employed to depress the action of the heart in fevers and inflammations. They must always be used with much caution, on account of their poisonous properties. It should be remembered, that some sedatives are *cumulative ;* that is, the medicine seems to remain for a time in the blood without producing any effect, and then all at once the effects of several or many doses of it are produced. On the other hand, after some of these medicines have been taken for a considerable time, the system becomes tolerant of their action, so that larger doses may be given than would at first have been safe. As a general sedative in excitement of the function of the nervous system, and also in states of vascular excitement, opium is often used. In certain inflammations, in their very early stage, it is sometimes given in a single large dose as a sedative after free blood-letting. More frequently it is combined with calomel, to prevent that medicine running off by the bowels, and in inflammations in asthenic persons, especially in those of the abdomen, it is used with much benefit in moderate doses at intervals of three or four hours. It is contra-indicated should there be drowsiness or a tendency to syncope, and it must be used with much caution in the inflammatory diseases of children.

Special sedatives.—Some sedatives appear to act chiefly upon certain nerves, or on certain parts of the nervous centres; thus, antimony and ipecacuanha affect the vagus nerve, influencing the function of respiration. Digitalis in its action is almost restricted to the nerves of the heart.

Many medicines seem to act for the most part in repressing the effects of excessive motor impulses, these are *antispasmodics.* They will be afterwards considered.

Stimulants.—Stimulants are those medicines which, being conveyed by the blood to the nervous tissue, exalt its function. As in the case of sedatives, their action may be general or special.

General stimulants.—General stimulants exert their influence equally upon every part of the nervous system. They are very numerous, and comprise substances derived from the mineral, animal, and vegetable kingdoms. Acting primarily on the whole nervous system, they secondarily excite the circulation, increasing the frequency and strength of the pulse. Being received into the stomach, they improve digestion by stimulating the nerves of that viscus. In large doses, however, they are irritants to the alimentary canal, and cause headache.

Stimulants act for the most part without influencing the mind. It is a question whether they actually increase nervous force, or merely call forth that which is already in existence.

General stimulants are used in states of syncope, or whenever there is failure of the heart's action from whatever cause. They are for the most part temporary in their action, and hence require to be frequently repeated.

Special stimulants.—Special stimulants are those, the action of which is confined to particular nerves or sets of nerves. Thus, some medicines act upon the spinal cord and the motor nerves connected with it. Strychnia is an example. Ergot of rye affects the nerves which are distributed to the uterus. Veratria is supposed to stimulate the nerves of the intestinal canal.

Medicines which repress the functions of the sensorium.—Narcotics.—By narcotic medicines we understand those which, passing from the blood to the nervous centres, depress nervous force, and act in an especial degree upon the sensorium and intellectual functions. Most narcotics have at first a stimulant action, and this varies much in length in different members of this class. Some produce excitement which lasts for a considerable time, as for example alcohol, tobacco, chloroform, &c. Afterwards the mental faculties are impaired and perverted; drowsiness follows, which may pass into stupor and coma. Opium affords the best example of a true narcotic. At first it slightly accelerates the pulse and exhilarates the spirits; this state of slight excitement is followed by drowsiness (out of proportion to the former excitement) and sleep, during which volition, sensation, and the functions of the organs of special sense are suspended. In this condition, the frequency of the pulse and respiration is lessened. Besides being a soporific, opium is also an anodyne—that is, it relieves pain independent of its soporific action. It likewise diminishes spasmodic contractions, and, as before mentioned, when given in large doses (page 150), is a sedative upon the action of the heart.

There are certain medicines which are not soporific, but yet in a marked degree anodyne: belladonna and hyosciamus are examples.

The action of medicines upon the sympathetic system, and secondarily through it upon the capillary circulation, is of great importance, but not as yet sufficiently investigated. It is however certain, that some remedies lead to contraction of certain capillaries, and others to dilatation. Ergot of rye and belladonna are examples of the first, strychnia is an example of the last.

Remedies which act upon the function of muscular tissue.—Muscular action being closely related to the nervous force and to the state of the blood, many of the remedies, which have been already considered, have the power of modifying it; as for example blood-letting, the warm bath, sedatives, nauseants, narcotics, &c.

Antispasmodics.—There are, however, certain medicines which appear to allay excessive muscular action, whatever may be its cause. The fetid gums, musk, valerian, and sulphuric ether may be mentioned as examples. Although the action of these medicines is very rapid, it is probable that they primarily affect the nervous tissue. They are most useful in those convulsive diseases which are independent of obvious lesion of the nervous centres, as hysteria, chorea, &c. They may also be given with advantage in spasmodic contraction of involuntary muscular fibre, as in spasmodic asthma and colic.

The remedies which excite muscular action have been for the most part considered under stimulants. It will have been noticed, that they also stimulate the nervous system generally; but there are some medicines—strychnia for example—which excite muscular action without affecting the sensorium or intellectual faculty.

Tonics.—When tonicity of muscular tissue is diminished, and, in consequence, all vital actions and nutrition are imperfectly performed, health is restored by a class of remedies called tonics. The action of medicines of this class is very various; some, no doubt, act through the blood, or upon the cells of the tissues; others on the nervous system, whilst a few directly affect the muscular tissue. Much of the success of tonic remedies will depend upon these points being remembered in their administration. Many tonic remedies are also stimulants, and "vice versa," many of the latter class have tonic properties. Tonics are used in states of debility, with diminished tonicity of muscular fibre; as also in adynamic states from many diseases. They should not be given when there is inflammation or irritation of the alimentary canal, nor when the secretions are scanty or depraved. The action of tonic medicines is often aided by what is called the *tonic regimen.* This consists in free exercise in a cool bracing air, cold bathing, frictions to the skin, and a nutritious diet.

Astringents.—The medicines which have the most direct and obvious influence upon muscular fibre, independently of their effect on the blood and the nervous system, are astringents. When these medicines are taken into the blood, they are conveyed to muscular fibre (usually the unstriped), and excite it to contraction. As muscular fibre exists in the walls of blood vessels and many tubes, they necessarily exercise an important influence upon various functions. Thus, they diminish excessive secretion from glandular organs, by lessening the calibre of the ducts of exit, and perhaps also by constricting the blood vessels which are distributed to them; and by exciting the muscular coat of the stomach and intestines, they give tone to those organs, and thus promote digestion and assimilation. Many astringents have the power of coagulating albumen, and in this way coagulate and condense fibrous tissues.

CHAPTER III.

REMEDIES WHICH ACT BY MODIFYING SECRETION.

Various effects are produced by modifying secretion. When it is rendered excessive the action of the heart is depressed; when secretions are over-abundant a tonic effect is produced by their diminution or suspension. Increase of secretion has also a derivant action. Moreover, it is by increase of the function of various glandular organs, that noxious matters are eliminated from the blood.

Eliminants.—Eliminants are medicines which increase secretion. They appear to do this as they pass out of the system through a glandular organ by stimulating its secreting cells. Certain eliminants prefer different channels of exit. Cathartics select the intestinal canal; diuretics the kidneys; diaphoretics the skin, and so on. Eliminants are administered with several objects. 1. To depress the action of the heart by diminishing the quantity of the blood. 2. To bring about absorption of effusions by removing water from the blood, and thus increasing its density. 3. To eliminate foreign matters from the blood. 4. To cause derivation, and thus lessen determimation in inflammation, &c.

Some of the classes of eliminants may now be noticed. Those that have already been described will be passed over.

Diuretics.—Diuretics are medicines which increase the secretion of urine. Some are absorbed into the blood, and are conveyed to the kidney without decomposition, and may be detected in that fluid; others suffer decomposition, some of the constituents only reaching the kidney. Many remedies indirectly act as diuretics, by removing certain pathological conditions, on which the diminution in the secretion of urine depends. Thus, in states of congestion or determination, blood-letting and other depleting agents have a diuretic action.

Diuretics may be used as sedatives by evacuation; but they are generally employed either to eliminate solid materials from the blood, or to promote absorption, by diminishing the amount of fluid in the blood. They should be given in rather a large quantity of fluid, lest, being too concentrated, they act as purgatives. The surface of the body should be kept cool, and dilutents freely drank during their action.

The stimulating diuretics are contra-indicated when the kidney is congested; given in that condition they suspend the secretion of urine.

Cholagogues.—Cholagogues are medicines which are believed to increase the secretion of the liver. All purgative medicines, and especially drastic purgatives, have a cholagogue action; but this is indirect, and due to sympathy between the intestines and liver. The medicines which have a direct action on the liver are probably few. Mercury is the best known, but doubts have of late been thrown upon the cholagogue action of this medicine.

Diaphoretics.—This class of medicines has already been noticed in regard to their action in depressing the heart, but they are useful with other objects. Thus, when the function of the skin has been suddenly suppressed by cold, and, in consequence, determination has occurred to internal organs, they are often very useful. They are also given with the view of eliminating some morbid material from the blood, as in gout and rheumatism. By their action excessive secretion from glandular organs may be diminished, as in diabetes; and on the other hand, when the function of an important excreting organ has been suspended, they are given to remove the noxious matters which are liable to accumulate in the blood. When diaphoretics are used, the surface of the body should be kept warm, and protected from draughts of cold air.*

Expectorants.—Expectorants are medicines which aid in the removal of secretion from the air passages. Nauseants, opiates, &c., act by removing spasm of the minute bronchial tubes, and thus facilitate the discharge of secretions; other medicines alter the secretion by diminishing its tenacity and adhesiveness, and thus facilitate its expectoration; whilst a third class operate through the nervous and muscular systems, by exciting contraction of the muscles of respiration, thereby promoting the expulsive efforts which are required for the removal of the secretion. Of this class ammonia is the best example.

Remedies which act mechanically or chemically.—Certain remedies are sometimes employed which, from their insolubility or some other cause, do not act upon the vital functions. Being brought into contact with certain tissues, they affect them mechanically; for example bismuth, introduced into the stomach, forms a sort of sheath upon the surface of that membrane, and shields it from the irritation of its contents. It is probable also, that the class of medicines called demulcents is useful in a somewhat similar manner. Of such mechanical remedies, one class *(anthelmintics)* is of much value in the destruction of entozoa in the intestinal canal. Some anthelmintics or vermifuges have merely a mechanical action, as tin filings and the pods of the dolichos pruriens; but it is probable that others, as male fern, koussoo, &c. are more or less poisonous to these creatures.

For the action of various subordinate classes of medicines, the student is referred to works on Materia Medica.

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* There is no more efficient mode of producing diaphoresis, than by the vapour bath. The patient, undressed, should sit upon a chair, and be covered from the neck to the ground with blankets; beneath the chair a vessel of water may be placed, and a hot brick introduced into it.

PART II.

SPECIAL PATHOLOGY.

Special Pathology and Therapeutics, or the Practice of Medicine, relates to the prevention, alleviation, and cure of individual diseases. It has, for the most part, reference to the special effects of such diseases upon the part or organ in which they may be situated; but it also takes cognizance of the general derangements to which the local disease may lead. As a knowledge of the phenomena, course, and termination of certain derangements, wherever they may occur, affords a clue to their effects when localised in a particular organ, General Pathology has an important bearing upon Special Pathology.

An individual disease is usually, if not always, an altered state of some of the solid or fluid constituents of the body. It is manifested or made known by certain phenomena, which are the symptoms and signs of it. In some instances it is possible to recognise a material organic change upon which these phenomena depend, in which case the "disease" is the altered or abnormal condition of the part or organ. For example, pneumonia is that condition of the lungs in which the air cells and the intercellular structures are charged with inflammatory exudations—pleuritis that condition of the pleura in which the surface of the membrane is more or less covered with flakes of lymph. But in regard to many diseases, we are unable to connect the phenomena presented to our observation with any structural unfitness, and are hence obliged to consider the group of phenomena or symptoms as the "disease"—fevers, hysteria, hydrophobia, and tetanus are examples.

In the management of an individual disease, the first point is to ascertain its situation and nature, or in other words, to make a *diagnosis.* The situation is usually revealed by derangement in the function of the organ which is diseased. Should the disease be in the lung, respiration will be deranged—in the stomach, digestion—or in the heart, the circulation of the blood. To this, however, there are exceptions. The function of a healthy organ may be deranged in consequence of a connection, probably nervous, with one that is diseased, and such derangement may be so prominent as to mask or hide that of the affected organ. This sympathetic relation is not unfrequent between the stomach and heart. The situation and nature of a disease are also made known to us by an examination of the physical condition of the organ, and by the patient's description of his feelings and sensations, coupled with the mode of commencement and subsequent progress of the attack.

Having made a *diagnosis,* we next endeavour to predict the result, viz., whether or not and when the patient will recover or die. This, in technical language, is forming a *prognosis;* and it is founded upon a consideration of all the circumstances of the case, viz., the nature, situation, stage, and cause of the disease, the character of the symptoms, and whether they are increasing or not, the age, sex, constitution, and idiosyncracy of the patient. The *diagnosis* and *prognosis* having been made, the treatment is next to be entered upon. This must be conducted with a due regard to the stage of the disease and the state of the system at the time of the attack, the predisposition, whether hereditary or not, the sex and age of the patient, the climate in which he may be living, and lastly the curative tendencies which the disease or individual may exhibit.

In the arrangement of the numerous diseases that we are called upon to examine, I shall make no attempt at scientific classification, believing that our knowledge of pathology is as yet too imperfect to permit of any system being adopted which is not open to objection.

I propose to treat first of diseases of the abdomen, then of the chest, afterwards of the head, and finally of those general diseases which cannot be located in any particular organ. These may be considered as so many divisions of the subject.

The diseases of each organ will be treated of in the following order :—

1*st.*—Capillary derangements.
  a. Inflammation and its results.
  b. Determination of blood and congestion, and their results.

2*nd.*—Derangements of nutrition.
  a. Hypertrophy.
  b. Atrophy.
  c. Morbid growths.
  d. Cancerous formations.
  e. Degenerations, *fatty*, *fibroid*, *tubercular*.

3*rd.*—Functional derangements.

In the description of each disease, the following order will, for the most part, be observed :—

1. Name, synonymes, and definition.
2. Hystory and frequency of occurrence.
3. Diagnosis.
4. Prognosis.
5. Pathology and morbid anatomy.
6. Causes.
7. Treatment and prevention.

The diseases which do not prevail, or are of rare occurrence in tropical countries, will be briefly considered.

SECTION I.

DISEASES OF THE ABDOMEN.

Boundaries of the abdomen.—The abdomen is bounded *above* by the diaphragm—which on the right side is as high as the fourth intercostal space, on the left as the fifth rib; *below* by the pelvis; *in front* by the seven or eight lower ribs and the abdominal muscles and fascia; *behind and on each side* by the vertebral column, ribs, and muscles.

Regions of the abdomen.—Two transverse lines,—one beginning at the most prominent point of the costal cartilages, the other at the crest of the ilium,—drawn round the body to similar points at the opposite side,—mark off three spaces or zones, which may be subdivided by a perpendicular line on each side, falling from the cartilage of the 8th rib to the centre of Poupart's ligament. The regions thus marked off are epigastric, umbilical, and hypogastric in the middle—hypochondriac, iliac, and inguinal at the sides.

CHAPTER I.

DISEASES OF THE PERITONEUM.

PERITONITIS.—*Inflammation of the peritoneum.*—Peritonitis is inflammation of the serous membrane which lines the abdominal cavity and invests the viscera. When unconnected with injury or visceral complication, the inflammation spreads over its whole surface; but when associated with pre-existing disease, or caused by a blow or penetrating wound, is often limited to the covering of the affected organ, or the immediate neighbourhood of the injury. For example in dysentery, the peritoneal investment of the cœcum, and in hepatitis of the liver and the opposed surface of the parietal layer, are alone implicated. Not unfrequently, these localised forms of peritonitis are in a measure conservative, being the means whereby extravasation of the contents of the hollow viscera or of an abscess is prevented. But this is not always the case; for it is not uncommon to find peritonitis limited to the investment of the colon in dysentery, or of the liver in hepatic abscess, when no progress has been made towards perforation or rupture; and in such cases, the peritoneal inflammation seems to be related to asthenic states of the system. Peritonitis may attack sthenic or asthenic persons, be a primary disease or consecutive upon an already existing malady, continue for weeks or months, or end in recovery or death within a few days or even hours. We therefore speak of it as *sthenic, or asthenic, primary, or secondary, acute, subacute, and chronic*.

Prominent symptoms.—Whatever may be the form of the disease, certain symptoms are nearly always present, viz:—The patient lies on his back with his thighs flexed on the trunk. He breathes short and quick, and his face is anxious, pinched, and expressive of suffering. The pulse is frequent, small, generally compressible, but sometimes hard and wiry, and the abdomen tender and preternaturally resonant on percussion. If previously healthy, he will most likely attribute the attack to injury of the abdomen, the action of a purgative, exposure to cold, or the use of some unusual article of food.

ACUTE PERITONITIS.

Symptoms in detail.—As met with in this, and indeed in all countries, peritonitis, unless caused by injury, occurs in persons who are more or less asthenic. It usually sets in with a chill, followed by some heat of skin, but fever is not a marked symptom. The abdomen is painful, and the pain increased by pressure, a deep inspiration, coughing, vomiting, and everything which causes contraction of the abdominal muscles. The abdomen is distended: at first it is tympanitic at the sides as well as in front, but as the disease advances, it becomes dull in the latter situation from effusion of fluid. In order to relax the abdominal muscles, and in that way prevent pressure upon the tender membrane, the patient lies on his back with the thighs flexed, and the chest inclined forwards. To lessen as much as possible the descent of the diaphragm, the breathing is thoracic, and being so, of course shallow and hurried. The pulse, remarkable for its frequency,—being seldom less than 100, and often as many as 120 or 130 beats in a minute,—is always small, and very generally soft and easily compressible. A hard or wiry pulse is rare in peritonitis within the tropics, being seldom present in Natives, and confined, even amongst Europeans, to those who have newly-arrived in the country. The face pinched, and the eyes somewhat sunken, is expressive of anxiety and distress. The skin is above the natural heat, but never pungent, as in some other inflammatory diseases. The tongue presents no characteristic appearance; it is most frequently thinly furred and white. The bowels, as a general rule, are neither constipated nor loose, though, in exceptional cases, they may be either the one or the other. It need scarcely be added, that the appetite is lost and the sleep impaired. On applying the ear or a stethoscope to the front part of the abdomen, a " friction sound," caused by the rubbing of the roughened surfaces of the membrane upon one another, is said to have been sometimes heard. Besides the symptoms above enumerated, there are others which may be called sympathetic ; of these, vomiting is the most common, but painful micturition and constipated bowels are not unfrequent.

Progress.—In some cases the progress is very rapid, death taking place in the way of syncope or asthenia within twenty-four hours. In other instances, the attack is prolonged for many days, or even two or three weeks ; usually, however, it terminates between the tenth and twentieth days. In the advanced stages, the abdomen becomes more painful and more distended—tympanitic in front, dull and tumid at the sides—the face more anxious and pinched, and the pulse smaller and more frequent and compressible. The tongue is dry and parched, sordes collect about the teeth and lips, and there is low muttering delirium. In the very advanced stage it is not uncommon for the pain suddenly to cease, but this is not a favourable event; it is too often accompanied by a rapidly-failing pulse, cold, and sometimes livid extremities, a ghastly expression of face, hiccup, coma, and convulsions, terminating in death. In favourable cases, generally between the third and fifth days, the pain begins to subside, the pulse is lessened in frequency, the countenance assumes its natural expression, and there is more or less complete recovery. In some instances no vestige of the disease is left, whilst in others, thickening of portions of the membrane, indicated by hardness and tumefaction, remains. Although the danger is increased the longer the disease has lasted, yet recoveries are occasionally witnessed from the most advanced stages.

It every now and then happens, that portions of the effused lymph being organized into bands of tissue, at a subsequent period cause very serious symptoms, by strangulating some portion of the intestinal canal; at other times the lymph, converted into pus, and becoming encysted by the organization of other portions of it, has been known to make its way through the abdominal wall, or into some of the hollow viscera.

There is a form of peritonitis common amongst the ill-fed inhabitants of large towns, and towards the close of exhausting diseases, which, from the insidious nature of its commencement and progress, is liable to be overlooked. It may be suspected, when in weakened or cachectic states, there is sudden increase of exhaustion, not due to any obvious depressing cause—the pulse becoming thready, the face pinched, and the skin coldish. On careful examination, the abdomen will be found to be tender, though the patient may not have complained of uneasiness.

It is said that acute *general* sometimes ends in *chronic* peritonitis, but of this I have never seen an example.

Peritonitis from effusion.—When peritonitis is caused by effusion, the symptoms are sudden, and characterized by depression and collapse; afterwards, when reaction is partially restored, they are very severe, and the disease runs its course with great rapidity, generally ending in death in two or three days or even less. In such cases, the inflammation occupies the whole surface of the membrane. Sometimes, however, before perforation takes place, lymph is poured out and organized, the viscera and parietal layers become adherent, and in this way effusion is prevented. Peritonitis from perforation is not uncommon in dysentery and typhoid fever, and from rupture in hepatic abscess and enlargement of the spleen.

Partial inflammation of the peritoneum is often met with in connection with visceral disease or injuries; the symptoms are less severe, and are often associated with derangement of special functions, according to the organ affected—as *of the liver*, indicated by jaundice, *of the stomach* by vomiting, and *of the bladder* by painful micturition. It is in these cases that more or less circumscribed tumefaction is generally to be observed.

Pathology.—The pathology of peritonitis requires but brief notice. The inflammation is limited to the membrane, and the subserous tissue. At first there is increase of the normal secretion, viz., serum, which is often poured out in considerable quantity. Lymph is soon effused, and the convolutions of the intestines, the parietal and visceral layers, become agglutinated. The predominant character of the lymph, whether fibrous or corpuscular, is determined by the constitution of the patient; the former being abundant in sthenic, and the latter in asthenic persons. The organization or degeneration of the lymph is mainly due to the relative proportion of these varieties.

Morbid appearances.—The peritoneum is reddened, sometimes uniformly, more frequently in patches, dots, or streaks; its brilliancy is destroyed—it appears dull or even opaque—the two surfaces are adherent by lymph more or less organized, as are also the convolutions of the intestines. The sac contains fluid varying in quantity from a few ounces to many pints; this is sometimes clear, but more frequently turbid from admixture with lymph, and not rarely puriform. The degree of organization will depend in part upon the length of time the disease has existed, but chiefly on the constitution of the patient and the cause of the inflammation.

Causes.—When peritonitis is primary, it is usually caused by injuries, as penetrating wounds, blows, exposure to cold,* and errors of diet. I have more than once known a fatal attack follow the action of a purgative. When consequent upon disease already existing, it is often immediately excited by effusions of various kinds into the peritoneal sac, the result of perforation or rupture. The contents of the stomach have escaped from an ulcer having perforated its coats. In dysentery and typhoid fever, the walls of the intestinal canal have been perforated by ulceration, and fæcal matters effused; so also the contents of the gall bladder or biliary ducts have escaped, and lastly, the urine has passed from the bladder by rupture or ulceration. The bursting of an abscess in the liver, or rupture of the spleen, has been by no means an unfrequent cause. But the mere existence of disease in an abdominal organ is sometimes sufficient. Doubtless the extension of the inflammation to the peritoneum in such cases is simply due to contiguity. That it occurs most frequently in weakly persons, is possibly nothing more than an exemplification of the general law, that all inflammations spread when the powers of the system are reduced. Altered states of the blood, from the absorption of noxious matters, or from defect in the activity of the depurating organs, frequently give rise to peritonitis. Parturient conditions, interference with the menstrual function, disease of the liver, kidneys, or spleen, &c., may be mentioned in illustration. Lastly, all circumstances which either directly or indirectly cause debility, predispose to the disease, by rendering the exciting causes more efficient. Amongst the more rare causes may be mentioned the retention of seeds and stones of fruits and other indigestible bodies in the appendix vermiformis, the performance of surgical operations—as for hernia, lithotomy, or ovarian disease—tapping the abdomen in ascites, the bursting of aneurism, &c. Finally, there is reason to believe that peritonitis may be connected with certain diatheses, such as the gouty, tubercular, rheumatic, and perhaps scorbutic.

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* Cold is a common cause in females during the menstrual periods and after abortion.

Diagnosis.—The diagnosis of peritonitis is not in general difficult. The marked tenderness of the abdomen, the decubitus, the appearance of the face, and the frequency and smallness of the pulse, leave in most cases little doubt of the nature of the attack. From enteritis it may be distinguished by the pain in the latter disease being of a more decidedly paroxysmal character, the bowels constipated, and vomiting more urgent. From colic it is known by the tenderness of the abdomen, the attitude of the patient, and the state of the pulse and countenance. There is, however, one derangement with which it is liable to be confounded, viz., neuralgic pain in hysterical females and in persons affected with spinal disease. In these cases, however, the pain does not increase in proportion to the amount of pressure; indeed, it is sometimes more severe when the skin is just touched or brushed over with the finger, than when firm pressure is made with the whole hand. In hysterical cases also, it may be remarked, that if the patient's attention is engaged by conversation, but little pain appears to be felt, whether the pressure be light or the reverse. Further, the characteristic attitude and appearance of the face are seldom present; or at all events are less marked than in peritonitis.

Prognosis.—Peritonitis is always a serious disease, but its danger depends in some measure upon the extent of the inflammation, the strength of the patient, and its connection or otherwise with pre-existing disease. Peritonitis from effusion is almost always fatal, and in a few hours. The next most fatal form is puerperal peritonitis. When unconnected with visceral disease or blood derangement, it is in the early stage amenable to treatment. The unfavourable symptoms are increasing frequency of the pulse and distension of the abdomen, sickness, and scanty urine; and above all, coldness and clamminess of the skin.

Treatment.—If the attack (which is rare) has occurred in a sthenic person, is of a few hours' duration, and not due to pre-existing disease, general blood-letting should be prescribed without reference to the state of the pulse; but the precaution must be taken of keeping the finger on the radial artery whilst the blood is flowing. Should the pulse become fuller and firmer, the bleeding may be continued; if smaller and more easily compressible, it must be at once stopped. After the bleeding, a sedative dose of opium is to be given, and the abdomen well fomented with hot water. If the patient is not sthenic (as is generally the case), or the disease has existed for more than a few hours, general blood-letting is inadmissible, but leeches should be applied to the abdomen, in numbers porportioned to the strength of the patient and the duration of the disease. Five or six dozen Bombay leeches in natives, and perhaps double that number in Europeans will usually suffice, and they may or may not be repeated, according to circumstances.* Blood having been drawn in sufficient quantity, main reliance should be placed upon opium, given in doses of from 1 to 2 grains every four or six hours. It relieves suffering, diminishes or suspends peristaltic action, and perhaps supports the vital powers. In sthenic cases, the opium may be combined with calomel, but the latter must be omitted should it act upon the bowels. Throughout the attack, the abdomen must be often fomented and stuped with turpentine. Blisters are contra-indicated in the early stage of the disease, chiefly because they would be applied too near the seat of the inflammation; but when the abdomen has become swollen and tumid, and the acute symptoms have somewhat subsided, a large blister is useful. Purgatives form no part of the treatment of peritonitis; but if the bowels have not been relieved for many days, and the abdomen has become much distended from tympanites, castor oil and turpentine, in the proportion of half an ounce of each, often give much relief. The regimen in sthenic cases should be at first rigorously antiphlogistic. As the disease advances, and in cases which are more or less asthenic even from the beginning, the strength must be supported by a diet which is moderately nutritious but unirritating, such as sago, arrowroot, milk, &c. As little is to be carried off by the bowels, only such food as is readily assimilated should be given. In the advanced stages, wine, chicken broth, &c., will be required.

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* It is of course to be understood, that cases may be so asthenic, even from the first, that the abstraction of blood is altogether inadmissible.

Chronic Peritonitis.

Chronic peritonitis, it is said, sometimes follows an acute attack, but more frequently the inflammation is chronic from the commencement. There are two forms, the *tubercular* and *non-tubercular*.

Tubercular peritonitis.—Tubercular peritonitis is usually met with in children, and is due to the deposit of tubercular matter, either upon the surface or into the substance of the peritoneum.

Symptoms.—The symptoms are in general obscure and insidious. At first there is fulness of the abdomen, with slight uneasiness scarcely amounting to pain. In front the abdomen is resonant, but at the sides dull and tumid. The swelling slowly but progressively increases. On placing the hand on one side, and gently tapping upon the opposite side, the impulse caused by fluid is perceived. As the disease advances, the fluctuation gives place to a more solid and inelastic feeling, which is due to thickening of the sub-serous tissues. Not unfrequently, from deposits of tubercular matter in the mesenteric glands, there are irregular knotty swellings. Pain is little felt, but uneasiness is complained of on firm pressure being made. The general health is impaired, the patient daily loses flesh and strength; and increased frequency of the pulse, and flushing of the hands and feet are noticed towards evening. The appetite is bad, capricious, or inordinate, and the food imperfectly digested. Distension, eructations, and other dyspeptic symptoms follow each meal. The tongue is florid, and the bowels irregular—looseness alternating with constipation.

Chronic peritonitis, in association with the tubercular diathesis, sometimes occurs in adults, there being deposit in the lungs as well as in the peritoneum. The symptoms do not materially differ from those just described.

Non-tubercular peritonitis.—There is reason to believe that chronic peritonitis may occur in other diathetic conditions than the tubercular, as in the scorbutic, rheumatic, and gouty. The recorded instances of this form of the disease are not very numerous, but it is probable that it has been sometimes mixed up with ascites. The symptoms are the same as in the tubercular form, but more obscure. Thus, in many instances, fever is absent, and in some even acceleration of pulse. As in the other varieties serous or sero-purulent fluid has been found in the peritoneal sac, and occasionally flakes of lymph. The membrane is thickened in places, and without its usual glistening appearance; redness is not common. The diagnosis of chronic peritonitis will be explained under ascites, which is the only disease with which it is liable to be confounded.

Causes.—The predisposing causes are certain diathetic conditions; of which the chief are the tubercular, scorbutic, and rheumatic. In the tubercular variety in children, it is immediately excited by the deposit of tubercular matter; in the other forms, where the predisposition is great, the ordinary exciting causes of inflammation are sufficient. The prognosis is on the whole unfavourable; cases of the tubercular variety, however, now and then recover.

Progress.—All the forms of chronic peritonitis follow very much the same course. The abdomen increases in size, chiefly from the accumulation of fluid; the asthenia becomes more marked, and the patient gradually sinks from exhaustion, many weeks or even months after the setting in of the first symptoms. Sometimes the fatal result is hastened, and immediately caused by an intercurrent affection, as dysentery, or phthisis; or the patient may be carried off in a few hours by an attack of acute peritonitis.

Morbid appearances.—In the tubercular variety, the omentum is matted to the intestines, and they to one another by lymph and tubercle. The peritoneum is from the same cause thickened and roughened. In the sac there is always more or less fluid, which is serous, sero-purulent, or purulent, and sometimes tinged with blood. It may be diffused, or limited by lymph which has become organized. The mesenteric glands are often enlarged from tubercular deposit.

Treatment.—In the early stage, a few leeches may be applied, and repeated at longer or shorter intervals, according to circumstances; afterwards, the abdomen should be painted over with the tincture of iodine, or sinapisms and blisters applied. Sometimes relief is obtained from the use of turpentine stupes. Absorption of the effused fluid is promoted by frictions with stimulating embrocations. The free abstraction of blood is in all cases contra-indicated. The general health must, if possible, be improved by tonics and alteratives; cod-liver oil, iron, or iron and iodine,—as the iodide of iron—iodide of potassium, small doses of mercury with chalk, or of the solution of bichloride of mercury are amongst the best of the remedies that are employed. Opiates will be required to allay pain or diarrhœa; and should there be constipation, the mildest aperients are alone admissible. When the appetite is bad, benefit is sometimes derived from the vegetable bitters.

ASCITES.—*Fluid in the sac of the Peritoneum, from determination of blood and congestion.*

Fluid may be effused into the sac of the peritoneum as a result of inflammation. The abdomen also sometimes enlarges suddenly after exposure to cold, without any inflammatory symptoms. The blood in such case contains an excess of fluid, in consequence of the secretion from the skin having been temporarily suspended, and this fluid separates as a secretion into the great serous sacs. Under ordinary circumstances, the kidneys take on a compensating action whenever the cutaneous secretion is diminished, and in this way excess of fluid in the blood is prevented. Hence, the form of ascites just referred to is usually associated with renal disease, under which it will be fully considered. Ascites is likewise met with as a part of general dropsy due to anæmia, or obstruction of the systemic venous circulation.

There is, however, one variety of ascites of a passive character, which is not, at all events in its early stage, associated with dropsy in other situations, and even at a later period, when anasarcous swellings *do* appear, they are limited to the lower extremities. The limitation of the serous effusion, for the most part to the abdomen, arises from the portal vessels being chiefly or alone involved—the ascites being due to disease of the liver, which obstructs the passage of blood through them. It is this form of ascites that will now be considered.

Symptoms.—After many weeks or months of impaired health, of which dyspeptic symptoms and general anæmia are the chief features, the abdomen begins gradually to enlarge, without pain or tenderness. As the swelling increases, fluctuation becomes apparent. In the recumbent posture on the back, the abdomen is resonant in front, by reason of the intestines floating upon the surface of the fluid, but dull at the sides, which bulge outwards. There is daily loss of flesh and strength, and derangements of function are produced by the accumulation of fluid—the chest being encroached upon, the breathing is hurried, and the heart being displaced and hampered, faintness and palpitation are induced. The veins on the surface of the abdomen are enlarged to compensate for the obstruction within, and as this becomes still more considerable, the blood is impeded in its passage from the lower extremities, whereby they become swollen and œdematous. Lastly, there are the symptoms of the hepatic disease, upon which the collection of fluid depends. If unrelieved, the abdomen becomes enormously distended, the patient day by day more emaciated, the functions of various important organs still more interfered with, and death results, either in the way of syncope, asthenia, or coma.

Diagnosis.—As enlargement of the abdomen is the prominent symptom, it must not be mistaken for abdominal swellings due to other causes. From pregnancy it may be distinguished by the bulging of the flanks, the tympanitic distension and fluctuation. Something may also be gathered from the patient's history in regard to the suppression of the menstrual secretion, and the presence of the other signs of pregnancy. Should there still be doubt, the sounds of the fœtal heart must be listened for, and an internal examination of the uterus made. The disease, with which ascites is the most likely to be confounded, is ovarian dropsy. The diagnosis has reference to the history, shape of the belly, percussion sound, and constitutional disturbance. In ovarian dropsy, the swelling commences on one side, and extends across to the opposite side; whilst in ascites, the whole abdomen becomes swollen about the same time. The fluid being in a cyst, there is not the bulging of the sides of the abdomen and overlapping or bagging of the flanks as in the latter disease. For a similar reason also, there is a difference in the percussion sound. Thus, in ascites, when the patient lies on his back the anterior parietes, when on his side the lateral region, and when on his face the lumbar regions are resonant. This is explained by the intestines floating on the surface of the fluid. In ovarian dropsy, the fluid reaches the abdominal wall without any portion of intestine being interposed, and consequently the percussion sound is dull in all postures. It should however be observed, that when the quantity of fluid is very large, the mesentery may not be long enough to reach to its surface, or the intestines may be empty, or bound down to the posterior wall by adhesions. In either case the resonance in ascites will be wanting; on the other hand, there may be gas in the ovarian cyst, when, of course, the percussion will be resonant: these are not common occurrences, but it is well to bear them in mind.

The diagnosis of ascites from chronic peritonitis is not always easy. By noticing the absence of fever and tenderness of the abdomen, the presence of œdema of the feet, and sometimes dropsical swellings; and by tracing the existence of some organic visceral disease, its true nature may in general be determined.

The danger of mistaking a distended bladder for ascites, might hardly be thought to require notice, were it not that the bladder *has* been punctured by mistake; should there be the least doubt, a catheter must be introduced.

Pathology.—Ascites, as just described, is caused by obstruction to the passage of blood through the liver. The portal circulation becomes congested, and the serous part of the blood transudes. Obstruction may be due to scirrhus, tubercular, lardaceous or amyloid deposit, or to chronic inflammation. Hence cirrhosis is a frequent, perhaps the most frequent cause.

Prognosis.—Ascites, associated with general dropsy, is often cured; so also is that which arises from determination of blood or slight inflammation of the peritoneum, or checked secretion from the skin or kidneys. When there is obstruction to the portal circulation, the prognosis will depend upon its nature. If it be simple congestion, the prognosis is of course favourable, but this is rare. As a general rule, when the dropsy is confined to the abdomen, it proceeds from causes which are not in themselves removable, and consequently the prognosis is unfavourable; still much relief may be obtained, and the progress of the disease materially retarded.

Treatment.—The objects to be aimed at in the treatment are—1*st*, to remove or delay the progress of the local disease; 2*nd*, to bring about the absorption or removal of the fluid. When congestion or inflammation is present, purgatives should be given, and blood drawn locally from the hypochondrium by leeches or cupping; small doses of blue pill, combined with ipecacuanha and hyosciamus are to be taken at bed-time, and counter-irritation by sinapisms, stimulating embrocations or blisters, used. The right side may be sponged with nitro-muriatic acid lotion, and nitro-muriatic acid administered internally in doses of from three to six minims thrice daily. It will however be found, that the cases in which the treatment just stated is likely to be of service are not common. In by far the greater number, the local disease is irremediable, and our attention must be directed to the removal of the fluid. For this purpose one or more of the emunctories must be acted upon, and some judgment will be required in selecting that which is the most appropriate. In tropical countries, where there is a tendency to muco-enteritis or dysentery, much caution is necessary in acting through the intestinal canal. In the first instance, diuretics should be tried, and of these the bitartrate of potass in doses of one scruple or half a drachm, combined with tincture of squills and nitric ether, is the most efficacious; should this fail, the nitrate or acetate of potass may be substituted. The diuretic action of these drugs seems to be promoted or even excited by giving at bed-time, for two or three successive nights, the following pills:—pil. hydrarg. grs. iv., pulv. scillæ gr. i., ext. hyosc. grs. v., or with the same object the ungt. hyd. fort., spread upon a piece of cloth, may be laid upon the abdomen. When ordinary diuretics have failed, they will sometimes act by combining with them small doses of tincture of digitalis (minims iii. to v.). Dr. Christison, of Edinburgh, speaks highly of digitaline in doses of $\frac{1}{60}$ of a grain; also of applying to the abdomen a cloth soaked in an infusion of the leaves of digitalis. Many practitioners recommend a mild course of mercury, so as to affect the gums, but if (as usually happens) anæmia is present, this had better be avoided. Should these measures fail, recourse must be had to hydragogue cathartics, such as jalap, gamboge, and elaterium. It need scarcely be added, that the two medicines last named must be used with the utmost caution, and their action carefully watched. The question of tapping the abdomen has been much discussed. All are agreed, that when the accumulation is very great, and interferes with some important function, as respiration or circulation, paracentesis should be performed as a palliative measure. But it has been recommended at an early period, in the hope that the fluid will not re-accumulate. To this practice I am opposed—1*st,* because there is no proof that it has been successful; 2*nd,* because it oftens hastens the fatal termination.

I do not of course deny that patients have recovered and remained well after paracentesis; but this has been so rare, when compared with the large number of instances in which they have not recovered, that the recovery cannot be viewed in any other light than as an accidental circumstance. Before we can attribute the cure of disease to any particular practice or remedy, some degree of uniformity in its effects must be established. If other things being equal, it fails more frequently than it succeeds, its curative powers are at least very problematical; and if failure is the rule and success the exception, no reasonable person will place confidence in it. But it is not alone on account of its inefficacy that paracentesis is objectionable. There is little doubt that it often hastens the fatal termination, sometimes by causing peritonitis—of which I have seen more than one instance—but more frequently by favouring the rapid re-accumulation of the fluid.

Cancerous formations.—Cancerous disease of the peritoneum is not uncommon as a secondary, though very rare as a primary disease. It often extends from an organ to the portion of peritoneum which forms its outer coat or investment; or commencing in the sub-serous tissue in the neighbourhood of the spinal column, involves the membrane in front of it. Hydatid formations have also occasionally been met with.

CHAPTER II.

DISEASES OF THE STOMACH.

Situation of the stomach.—The stomach is situated in the left hypochondriac, epigastric, and part of the right hypochondriac regions. Its left extremity is in relation with the spleen, pancreas, left kidney, and supra-renal capsule; its right or pyloric end with the liver, lesser omentum, and pancreas. In front the stomach is separated by the diaphragm from the last six ribs. When distended with gas, it renders the greater part of the left side of the chest tympanitic, and sometimes displaces the heart upwards.

GASTRITIS.—*Inflammation of the mucous membrane of the stomach.—Acute, subacute, chronic.*

ACUTE GASTRITIS.—Acute gastritis is rare, unless caused by an irritant poison.

Symptoms.—It is characterized by burning pain and tension in the epigastric region, a pinched and anxious face, a small pulse, and some, though not marked, febrile disturbance. After an irritant has been swallowed, a sense of dryness, heat, and constriction is felt in the throat, and soon after at the scrobiculus cordis. Vomiting sets in and becomes urgent; after the stomach has been emptied, a little bile and mucous tinged with blood are alone brought up. Difficulty in swallowing from spasm of the œsophagus is sometimes present. The face is pinched, anxious, and expressive of suffering and distress; the pulse frequent, small, and easily compressible. The tongue quickly assumes a florid appearance, especially at the edges and tip, and great thirst is complained of. On pressing the epigastrium, pain is felt, as it also is during a deep inspiration, the act of vomiting, and coughing. In severe cases, the skin becomes cold and clammy, the pulse thready, the face more pinched, and the eyes sunken. Hiccup sets in, and death takes place in the way of asthenia, sometimes in a few hours, and certainly within two or three days. When, however, the irritant has been small in quantity, or the inflammation subdued, the vomiting becomes less and then ceases, the face assumes its natural expression, the pulse becomes less frequent and more developed, and the tenderness of the epigastrium is no longer felt.

Sub-acute Gastritis.—Sub-acute gastritis is common. It may be caused by the abuse of spirituous liquors, or by over-stimulating or indigestible food; but is more often associated with other diseases, as fevers and cholera. In the latter disease it is a frequent cause of death during the second or reactionary stage. The symptoms do not differ from those of the acute form, further than in being less urgent. Heat and tension are little complained of, but there is tenderness in the epigastrium, the face looks pinched, the tongue florid, and vomiting is more or less urgent. The pulse is frequent, small, and soft, and the skin somewhat above the natural heat. These symptoms may continue for many days with little or no change. In favourable cases they slowly disappear—the stomach retains food, the skin falls to the natural temperature, the pulse increases in volume and decreases in frequency, the countenance loses its pinched and anxious expression, and the appetite is restored. In unfavourable cases, there is day by day a loss of strength and flesh; nothing is retained in the stomach, the tongue becomes dry as well as florid, and there is great restlessness.

Low muttering delirium follows, and death in the way of asthenia or coma, many days (ten to twenty or thirty) after the commencement of the symptoms.

Pathology.—Gastritis is inflammation essentially confined to the mucous membrane of the stomach and sub-mucous tissue, the other coats seldom if ever being implicated, except they have been destroyed by a corrosive poison. Lymph is effused in but small quantity, and is never plastic.

Morbid appearances.—The stomach is usually contracted, the lining membrane thrown into folds or wrinkles, and the surface covered with tenacious reddish mucous, or a more or less puriform fluid. It is marked with patches of redness, which appear as dots and streaks of various forms, sometimes bright and florid, at others of a dark slate colour, and occasionally almost black. The membrane at the discoloured spots is thickened and softened, and readily separates by scraping with the back of the knife. In some instances it is even reduced to a pulp. Ulceration in the acute forms of gastritis is rare. In deciding upon the existence of inflammation, too much weight must not be attached to redness, as this may be caused by mere excitement of, or obstruction to, the circulation of blood through the portal vessels. It should always be considered in connection with the other morbid appearances.

Prognosis.—Acute gastritis is always a serious disease, and when caused by irritant poisons often fatal. The sub-acute form is also a grave complication of cholera, remittent and other fevers.

Causes.—When unconnected with other disease, gastritis is usually caused by irritant substances in the stomach, as corrosive, mineral, and vegetable poisons. But should there be great predisposition, milder irritants—alcohol, condiments, irritating food, and drinking largely of very cold water may be sufficient. The diseases with which gastritis is most frequently associated are fevers and cholera, but it sometimes arises from the translation of gout and rheumatism.

Treatment.—It need scarcely be said, that irritating matter in the stomach must be removed or neutralised. The patient should drink freely of warm water, in which 15 or 20 grains of ipecacuanha powder have been dissolved, and antidotes and diluents should afterwards be given.

In the acute form in sthenic persons, general blood-letting is proper at the commencement of the attack, and this, perhaps, without reference to the state of the pulse. It is necessary however to watch the effect of the flow of blood with much care (page 166). In asthenic persons, or when the inflammation is sub-acute, leeches to the epigastrium are sufficient. Much benefit cannot be expected from drugs, for the obvious reason that they are rejected by vomiting. The bowels should be moved by enemata; and afterwards, should the distress be very great, opium in enemata, or as a suppository, may be prescribed. The local abstraction of blood should be repeated according to the degree of tenderness and the strength of the patient, and followed by the application of sinapisms or blisters. If any medicine *is* given by the mouth, small doses of carbonate of soda, with a few minims of dilute hydrocyanic acid and of tincture of opium, will be most suitable.

In sub-acute cases, effervescing draughts are useful; and in all, when the inflammation has been somewhat subdued, the vomiting is often checked by a full opiate. In the advanced stages, should there be reason to suppose that gangrene has occurred, or is about to occur, opium in moderate doses may be given every three or four hours. Dr. Wood, of Philadelphia, recommends small doses of turpentine. Throughout the attack the diet must be very restricted; at first in acute cases it should be rigidly antiphlogistic,—a spoonful or two of thin congee or barley water being alone given. Afterwards, and in the sub-acute cases, milk combined with lime water may be drunk in small quantities. The patient should frequently take a little iced water, and small pieces of ice may be swallowed. During convalescence, the diet must be carefully regulated to guard against a relapse, which is very liable to occur. Some practitioners recommend calomel in combination with opium. I have no practical acquaintance with this remedy in gastritis, and cannot but think that it is contra-indicated, both upon physiological and therapeutical principles.

Chronic Gastritis.

It sometimes happens, that acute or subacute inflammation of the stomach, having been in part but not altogether removed, becomes chronic; but more frequently chronic gastritis begins as such, follows the usual course of other chronic diseases, and shows a similar tendency to disorganization and destruction of tissue.

Symptoms.—The commencement of chronic gastritis is in general insidious. At first uneasiness and a little nausea are felt after eating, the appetite is deranged, and headache and soreness of the limbs are complained of. Then there is pain of the epigastric region, increased by firm pressure, and most felt after food has been taken. The pain may be confined to the scrobiculus cordis, or it may radiate backwards towards the spine, or into the hypochondrium, or even along the arm to the elbow or hand. It is dull and gnawing, or lancinating, and subject to frequent intermissions and exacerbations. The symptoms of functional derangement become more numerous and severe—heartburn, flatulent distension, acid eructations, and pyrosis (water brash) are generally present. Vomiting now is in many instances a constant symptom whenever food is taken; bile, mucus, a glairy or acrid fluid, and sometimes blood, being amongst the matters vomited. The blood is often discoloured by the gastric secretions, giving a dark appearance to the contents of the stomach. The tongue is florid, its papillæ prominent, and in the advanced stage covered with apthæ. The pulse is usually frequent, and sometimes intermittent. Hectic is not uncommon towards evening or after a meal, and emaciation, which is always more or less, is in proportion to its severity. The morbid sensations are not always confined to the region of the stomach, various sympathetic derangements being common. Thus, irregular attacks of palpitation, headache, dimness of sight, noises in the ears (tinnitus aurium), giddiness, impairment of muscular power, numbness, and indeed almost every possible derangement may be present. The mind is often affected; irritability of temper, gloominess, despondency and the like being seldom absent. On account of the close relation between the stomach and respiratory organs through the pneumo-gastric nerve, cough is a common symptom—a peculiar ringing spasmodic cough, which is well known as "stomach cough." The progress of chronic gastritis is slow; it often continues for months or years, with periods of intermission of longer or shorter duration. When the patient dies, death is often immediately caused by some secondary disease, as of the liver or kidneys.

Ulcer of the stomach.—It is not uncommon, especially in young females, for peritonitis to occur suddenly, and terminate fatally in a few hours. Examination after death has in many instances shown that it was caused by the escape of the contents of the stomach, in consequence of the perforation of its coats by an ulcer. Symptoms of chronic gastritis may have been altogether absent, or they may have existed in a more or less severe degree for a variable period before death.

The ulcer just noticed occurs at all ages, and is usually situated on the posterior wall near the pyloric extremity. Its size is from that of a split pea to half a rupee. Once formed, it may follow different courses. It may heal up, leaving a cicatrix, which is often seen after death ; on the other hand, increasing somewhat in size, keeping up constant irritation, and thus interfering with digestion, it leads to death by exhaustion. Penetrating the coats of the stomach it causes peritonitis, or opening into the branch of an artery, severe or even fatal hæmorrhage. The symptoms are those of chronic gastritis with the addition of some which are peculiar. Thus, the pain is often limited to a circumscribed spot—which may be covered with the point of the finger—either a little below the ensiform cartilage, or on one side of the vertebral column. Vomiting is an urgent symptom, and sometimes the matters ejected are mixed with blood. It comes on soon after food or drink has been taken, especially when hot or stimulating. Vomiting of blood is the most pathognomic symptom. If this is associated with symptoms of gastritis, and has been preceded by the peculiar pain above described, there being no evidence of disease at either of the orifices, it may be considered diagnostic.

Ulcer of the stomach is a common disease. At one of the large hospitals in London, it is said to have been present in one out of every hundred out-patients. It has been observed more frequently in men than in women, and in the middle and advanced periods of life. It might be thought, considering the disturbing influences that are in operation, that it would rarely or never heal, but the reverse is true. It often heals, and according to Dr. Brinton, the cicatrix is not less often found in dead bodies than the open ulcer. It is very prone to pass through the coats of the stomach, the calculation being, that one in every eight does this in males, and three times as many in females between 15 and 25 years of age. It remains to be ascertained how far this statement is true of the natives of India.* The rupture is often immediately brought about by some unusual exertion, as vomiting or straining at stool.

Pathology of chronic gastritis.—The sub-mucous tissue is thickened from deposits. The mucous surface is usually of a dark slate colour, dotted over with numerous red points, which are villi injected with dark-coloured blood; the structure of the membrane is altered—being sometimes indurated, but more frequently softened. The thickening and induration are often confined to the mucous follicles, which being clustered together, give the membrane a mammillated appearance. Sometimes the thickening is chiefly in the sub-mucous tissue in the neighbourhood of the pylorus, which it surrounds by a circular band, forming a kind of stricture. Ulcers of various sizes are occasionally met with, not confined to any part of the organ. They should be distinguished from the very generally solitary ulcer observed at the pyloric extremity, and which often occurs in a stomach that to appearance is otherwise quite healthy. After death from gastritis, the mucous membrane has been found free from appreciable change, but the sub-mucous tissue was more or less affected. There are other morbid appearances seen under the microscope, but it is uncertain how far they are due to inflammation. According to Dr. Handfield Jones, one of the most common arises from the infiltration amongst the gastric follicles of a low fibroid tissue, which by its pressure leads to their destruction. In other instances, there are "masses of nuclear particles at the bases of the tubes encroaching upon them; often, also, in the substance of the mucous membrane, and sometimes on its surface." Dr. Jones describes the mammillated condition as depending upon a process of local atrophy, the tubes being wasted in the tracks of the furrows, which are sometimes so distinct as to fissure the membrane down to its corium.

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* Patients are often treated in the Clinical Ward of the Jamsetjee Jejeebhoy Hospital for supposed ulcer of the stomach, and every now and then it has been found in examinations after death; but in no instance has it been known to perforate the coats.

Softening of the mucous membrane of the stomach.—Softening of the lining membrane of the stomach is sometimes met with under circumstances which render it improbable that it is due to inflammation. It is not uncommon in infants between the ages of four and eighteen months, and especially in such as are brought up by hand, or are suffering from remittent fever or cerebral affections (hydrocephalus). It seems indeed to be related to a state of general anæmia. What the actual cause of the softening is in these cases has not been ascertained. For example, it is not known whether from some pathological change the membrane becomes more susceptible of the action of the gastric fluid, or whether that fluid becomes more potent as regards its solvent properties. There is, moreover, a doubt as to how much of the solution occurs before and after death. But softening of the coats of the stomach must not at all times be regarded as an evidence of disease. It is a well established fact, that the action of the gastric juice is sufficient to dissolve the coats of the stomach after their vitality has been lost. It should be observed, however, that the softening from this cause is at the fundus, and limited to that portion upon which the gastric juice may be supposed to have rested. Should there be perforation, the edges of the aperture are thin, irregular, and soft, and unlike the swollen and hardened margins of ulcers. This kind of softening is most common in persons who have met with their death by violence, not long after having taken a meal. If then, it is certain that the gastric juice may dissolve the tissues of the stomach as readily as a piece of meat, it may be asked, why we do not more frequently meet with softening produced in this way? It must be remembered, that gastric juice is often absent at the time of death. It is well known only to be secreted in quantity when food is present, and it is rare, except in sudden death, for the stomach to contain much if any food at the moment of dissolution; consequently, in most instances there is no gastric juice to act upon the stomach. Further, it would seem that, when its acidity is neutralised, the solvent action is destroyed, and this not unfrequently happens about the time of or a little before dissolution, on account of the administration of alkaline stimulants, such as ammonia.

Causes.—The causes of chronic gastritis are not well understood. It may originate in diathetic conditions, as the arthritic or tubercular. In most instances it is attributed to frequently repeated irritation from indigestible food or alcoholic liquors. Long-continued functional derangement seems to lead to it. How far malaria is a cause, has not been sufficiently ascertained, but the florid tongue, tender epigastrium, flatulent distension, &c., which are so common in malarious cachexia, would seem to leave little doubt of the effect of this agent.

Treatment.—The most important part of the treatment consists in due regulation of the diet. Stimulating food should be entirely withheld; at the same time it must be borne in mind, that however undesirable it may be to call upon the stomach for *any* kind of work, yet, as this is the channel through which nutrient material is introduced, we cannot afford to allow it to be altogether undisturbed; nor should it be forgotten, that too great abstinence from food is in itself calculated to produce irritation, if not inflammation, of that organ (page 93). Small quantities of bland and unirritating but nutritious food should therefore be taken. Milk, mixed with an equal quantity of lime water, may be given in small quantities at moderately short intervals, and after a day or two, a little biscuit or rusk should be dissolved in the milk, the quantity of lime water being diminished. Many classes of the natives of India can scarcely live without rice,—a little may therefore be allowed with the milk, or simply boiled. As the irritation gradually becomes less, half boiled eggs, and for those of whose diet animal food is an ingredient, a little boiled mutton or fowl may be allowed. It is difficult to lay down arbitrary rules regarding diet, and particularly in India where the food of different castes is so various. The principle is this—as much nutritious food as can be taken without producing pain, vomiting, or flatulent distension, should be recommended. It should be of the least possible bulk, and free from spices, condiments, and everything of a stimulating or irritating nature: wine, spirits, and other fermented liquors, tea and coffee, should in most cases be abstained from. It would not be right, however, to neglect the patient's longing for some particular article of food, experience having shown that a kind of diet has sometimes agreed well, which "a priori" reasoning would have emphatically condemned. In acceding to a patient's wishes in this respect, much care and watchfulness are necessary.

According to the degree of tenderness at the epigastrium, the floridity of the tongue, and the general condition of the patient, leeches may be applied to the epigastrium, followed by counter-irritants. The leeches should be few in number, and repeated at intervals of one or two days, for a week or more, according to circumstances. The best kind of counter-irritation is a blister, which should be of small size, not more than two inches in diameter, and frequently repeated. The bowels must be regulated by enemata or very mild laxatives, such as magnesia, rhubarb, or castor oil. Should these measures prove insufficient, we may have recourse to some of those internal remedies which have a local action upon the mucous membrane of the alimentary canal. The sub-nitrate of bismuth, or the nitrate of silver, are probably the best of this class, and they may often be combined with small doses of morphia or opium. When there is much irritability of stomach, ten or fifteen grains of the sesqui-carbonate of soda, with three minims of the dilute hydrocyanic acid, and five of tincture of opium will often give relief. As the disease begins to subside, recovery is hastened by the judicious use of tonics. During the treatment, the state of other functions must be carefully scrutinized, and derangement of them removed, provided that this can be effected without fretting the stomach by the use of much medicine. The function of the liver, and in females of the uterus, requires to be most carefully watched.

It need scarcely perhaps be mentioned, that moderate exercise in the open air, and a cheerful and sufficiently occupied mind are essential to recovery. Change of scene and climate is often beneficial. When there is reason to suspect the existence of ulcer of the stomach, the diet must be severely regulated, and much caution observed in the return to more nutritious food.

Congestion of blood in the stomach.—The vascular connection between the stomach, liver, and spleen, makes it easy to understand that disease of either of the latter organs may cause congestion of the former. A common result of such congestion is effusion of blood upon the mucous membrane, viz. *gastric hæmorrhage.*

Gastric hæmorrhage may also be due to disease of the stomach itself, or to disorganization of the blood, in which case it is associated with bleeding elsewhere. The blood may be, and often is, vomited (hæmatemesis), or passing into the intestines, discharged by stool melæna), whilst occasionally, though rarely, it remains in the stomach.

Symptoms.—The chief symptoms of gastric hæmorrhage are nausea, distension, and weight at the epigastrium, faintness, giddiness, and dimness of sight. Should these symptoms occur suddenly in a person, who from the causes above stated is predisposed to gastric hæmorrhage, we may be nearly sure of the nature of the attack; and if, as often happens, blood is vomited in dark-coloured clots, all doubt is removed. The symptoms which usually precede hæmatemesis, may however have been absent, or the patient unable to give any account of them; hence, it may sometimes at first seem doubtful whether the bleeding is from the lungs or stomach. There is not in general much difficulty in deciding this point. Blood from the lungs is *coughed up*—is fluid, of a florid colour, and frothy. Blood from the stomach is *vomited up*—is in clots, of a dark colour, and not frothy. The only difficulty is, when the bleeding, being from the lungs, the blood after reaching the mouth, has been swallowed. Such blood will, of course, when vomited, present the same characters as in true hæmatemesis. Here the diagnosis must be based upon the attendant circumstances. Hæmoptysis is usually preceded by a pricking or tickling sensation in some part of the chest, more or less cough is present, and moist rales are heard. Hæmatemesis is ushered in by nausea, faintness, and a feeling of weight and distension at the scrobiculus cordis. The dark colour of the blood is due to the action of the secretions from the stomach. It must be remembered, however, that the colour and even fluidity will in some measure depend upon the length of time the blood has been in the stomach; should it have been at once vomited, the florid colour and non-coagulation will scarcely fail to be noticed. Its large quantity, and the mode and rapidity of its discharge, will in such cases leave no doubt as to the organ from which it proceeds.

Pathology and causes.—Between the pathology of gastric hæmorrhage and ascites there is much resemblance. They are each caused by over-distension of the portal vessels, and the same disease of the liver (cirrhosis) will at one time lead to effusion of blood into the stomach and intestines, and at another of serum into the peritoneal sac. When obstruction is not great, the serous part of the blood transudes; but when it is considerable, minute vessels are ruptured, and hæmorrhage ensues.

In altered states of the blood, and congestion of the large glandular organs,—the liver and spleen,—gastric hæmorrhage is common, and consequently hæmatemesis is often a symptom in the advanced stages of adynamic fevers. The vomited blood has a dark grumous appearance, not unlike coffee grounds, and is familiarly known as the "black vomit." Hæmatemesis, vicarious upon suppression of the menses, is of occasional occurrence, and large quantities of blood are sometimes thrown up at the menstrual periods. Not rarely it is associated with similar vicarious bleedings elsewhere. In cachectic persons, when the spleen is enlarged, vomiting of blood often occurs, and has sometimes been coincident with a sudden diminution in the size of the enlarged organ. The stomach may have blood poured into it from an aneurismal sac, and such cases are usually distinguished by the large quantity of fluid red blood which is suddenly vomited. Lastly, organic disease of the mucous membrane, in which there is destruction of tissue, may be attended with hæmorrhage.

Prognosis.—The prognosis is on the whole favourable, as regards the immediate effect of the hæmorrhage upon life. Few persons sink under a single attack, although large quantities of blood are sometimes lost. The exceptional cases are of aneurism bursting into the stomach. The probability or otherwise of a complete cure, must of course depend upon the nature of the organic disease which is present. In a considerable proportion of the cases, the organic disease is incurable. That variety of gastric hæmorrhage which is vicarious upon suppressed menstruation, is attended with the least danger.

Treatment.—Two indications are to be kept in view:—1*st*, to check the bleeding; 2*nd*, to remove the cause, and thus pervent its recurrence. The patient must be restricted to the recumbent posture. He should swallow at short intervals a little cold water or small pieces of ice, and if the bleeding is very profuse, cold may be applied to the epigastrium. Little or no food is to be taken for several hours. Should these means not be successful, astringents and styptics must be given; and of these tannic and gallic acid, acetate of lead and opium, alum and kino, are the best. Turpentine in small doses is recommended by Dr. Wood of Philadelphia.

When the hæmorrhage has ceased—or even before, if it can be ascertained,—the cause of the bleeding must if possible be removed. Cachectic and scorbutic states will require tonics and anti-scorbutics. If the liver is at fault, small doses of the milder mercurial preparations and purgatives will be required. When the spleen is enlarged, a combination of quinine and iron is the most suitable remedy. In vicarious hæmatemesis, attention should be chiefly directed to the restoration of the menstrual secretion.

Carcinoma of the Stomach.

The cardiac and pyloric ends of the stomach are often the seat of cancerous disease. All varieties are met with, but scirrhus and colloid are the most common.

Symptoms.—The symptoms do not materially differ from those of chronic gastritis: the pain, it is true, is sometimes of a lancinating character, but this is by no means always the case, and the same kind of pain is occasionally present in chronic gastritis. Vomiting is common to both diseases, but it is important to notice the time when it occurs. If the food is rejected as soon as, or before it is completely swallowed, we may conclude that the cardiac orifice is affected. If vomiting does not come on for an hour or two, the presumption is great that the pyloric end is involved. In either case the disease is probably malignant. When there is almost complete obstruction of the pylorus, the vomited fluid becomes covered with a layer of froth, which has the appearance of fermenting beer. In this the common yeast plant is found, as also another fungus, the "*sarcina ventriculi.*"*

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* The *sarcina ventriculi* was first described by Professor Goodsir, of Edinburgh, and has been since frequently met with.

The sign of malignant disease, to which the most importance should be attached, is swelling in the epigastrium. If this has come on slowly, preceded and accompanied by symptoms of chronic gastritis, and associated with cancerous cachexia, little doubt will remain. The absence of marked symptoms would not negative the existence of cancer, and hence the diagnosis is sometimes obscure and difficult. Many instances are recorded, in which there were no symptoms that could in any way be referred to the stomach. The progress of malignant disease is always towards a fatal termination. The patient becomes more and more emaciated, and at length sinks from exhaustion; but the rapidity of the progress is subject to much variety—sometimes a few months, at others seveval years intervene between its commencement and end. Every now and then the symptoms remit for a time, but are sure to return. In general the suffering is great, and when the cardiac end is affected, the pangs of hunger are not the least part of it.

Anatomical characters.—The stomach is contracted or enlarged, according as the disease has affected the cardiac or pyloric ends. The cancerous deposit may be limited to the neighbourhood of one or both orifices, or occupy the greater part or even the whole of the organ. Its appearance will, of course, depend upon the kind of cancer, and the time at which death may have taken place. Thus, there may be hard roundish masses (scirrhus or colloid), or soft brain-like swelling (encephaloid), and these may or may not have taken on ulceration. The ulcers usually have hard, elevated edges, and the surface is covered with fungus granulations. Occasionally they make their way through the coats of the viscus. Care must be taken not to confound the appearances of malignant disease with simple hypertrophy of the organ, the result of chronic gastritis. As a consequence of narrowing of the pyloric orifice from inflammatory deposits, the muscular coat sometimes becomes hypertrophied. This hypertrophy being mixed up with thickened and indurated areolar tissue, presents an appearance which might at first be mistaken for malignant disease. The cut surface will, however, be found to be uniform in structure, and without the morphological elements of cancer.

Treatment.—The treatment of cancer of the stomach is altogether palliative. When pain is very severe, relief is sometimes obtained from the application of a few leeches to the epigastrium, followed by moderate counter-irritation. But in general we must trust to opium and other narcotics; the diet should be carefully regulated, and symptoms of chronic gastritis or dyspepsia met as they occur.

Wounds of the stomach.—Wounds of the stomach are generally but not always fatal.* Much of the danger will, of course, depend upon the situation and size of the wound, and the condition of the organ at the time of injury in regard to fulness or emptiness.

Displacement of the stomach.—It occasionally happens that the stomach, along with some of the other abdominal organs, passes through the diaphragm into the chest, causing symptoms of disease of the thoracic organs. Several such cases are recorded.†

GASTRO-ENTERITIS.—*Inflammation of the mucous membrane of the stomach and intestines.*

Acute gastro-enteritis is almost always caused by an irritant poison. Sub-acute gastro-enteritis is common in cholera and malarious fevers.

Chronic gastro-enteritis.—The chronic form is often a primary or idiopathic disease. The early symptoms are obscure. At first there may be a little uneasiness after taking food, and to this is soon added vomiting. The bowels become irregular,—attacks of diarrhœa alternate with constipation. The patient loses flesh, the skin becomes dry, and the tongue florid and glazed. The abdomen is generally sore and uneasy, but there is no decided tenderness. As the emaciation increases, hectic flushes towards evening are noticed. The appetite is capricious, and apthæ are apt to form at the edge and tip of the tongue.

Gastro-enteritis is slow in its progress, but in general tends towards an unfavourable termination. The morbid appearances are patches of dark marbled redness and softening of the mucous membrane of the stomach; vascular patches—sometimes with softening, at others with granular exudation—at the lower part of the ileum and in the colon. The solitary glands are often enlarged and prominent, and circular ulcers are occasionally found scattered here and there.

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* Transactions of Medical and Physical Society of Calcutta, No. I., page 56.

† British and Foreign Medico-Chirurgical Review, 1858, page 923. Lancet, 1855, Vol. I., page 93.

Chronic gastro-enteritis seldom occurs except in weakly and debilitated persons. Its exciting causes are not apparent. The treatment consists in the restriction of the diet to that which is bland and unirritating, but at the same time sufficiently nutritious—as milk, eggs, sago, arrowroot, &c. Great care should be taken to maintain the function of the skin by suitable clothing. In regard to internal remedies, the indication is to diminish irritability by the use of opiates and sedatives, and to check diarrhœa by vegetable astringents. Small doses of the tincture of opium, with 3 or 4 minims of dilute hydrocyanic acid may be given three or four times in the day, combined with 10 grains of the sesquicarbonate of soda. Bismuth is sometimes useful in doses of 10 to 20 grains, and it may be combined with tanic or gallic acid. Small blisters may occasionally be used with benefit to the epigastric or iliac regions. The question of change of climate will require to be carefully considered.

Dyspepsia.—*Indigestion or functional derangement of stomach.*

Many of the symptoms which indicate derangement of digestion, are common without organic disease. It is usual to designate them by the term "dyspepsia."

Acute Dyspepsia.—Acute dyspepsia generally follows a full meal, and sets in with a feeling of distension and weight in the epigastrium and left hypochondrium, followed by acid and bitter eructations, nausea, headache, and aching of the limbs. The tongue is white and covered with a thick fur, the pulse soft and not frequent, and the skin cool. These symptoms having continued for a few hours, vomiting occurs, and a quantity of undigested food is thrown up with great relief. For a few days the stomach is weak and easily irritated, requiring that the diet should be restricted. The cause of acute dyspepsia is too full a meal or indigestible food, or food taken when the stomach has been weakened by fatigue, too long fasting or mental depression, &c. Certain articles of food almost invariably cause dyspepsia in some persons—shell fish, certain fruits and vegetables, are examples. In some idiosyncracies, what are ordinarily the most digestible aliments cannot be taken without deranging the stomach.

Treatment.—Nature suggests the treatment. Perhaps we cannot do better than leave the case in her hands; should, however, the suffering be considerable, or the vomiting delayed, 25 grains of the powder of ipecacuanha may be taken as an emetic, and warm water freely drank to encourage vomiting. The patient's diet must be restricted for a few days, and he should be warned not to indulge in future in the quantity or kind of food which may have appeared to bring on the attack. He should also be enjoined to abstain from active exercise just before or after a meal; and, as far as possible, to remove himself from those influences which weaken the power of the stomach.

There is a variety of acute dyspepsia which is familiarly known as a " bilious attack." The symptoms are very much like those just noticed, with the addition of more nausea, and sometimes continued vomiting. There is at times febrile disturbance, and occasionally distressing headache. The vomited matters, which have a bitter acrid taste, are of a yellowish green colour. The attack continues from a few hours to three or four days, and either spontaneously subsides or appears to be carried off by free evacuation from the bowels. It is usually preceded by slight anomalous derangements, by which its approach may sometimes be foretold; such as languor, noises in the ear, flying pains in the right shoulder and arm, &c. The cause is believed to lie in derangement of the biliary apparatus, but the exact nature of the derangement is not known. It has been referred, but on insufficient grounds, to excessive secretion of bile, or to its accumulation in the duodenum: this belief no doubt arose from the bilious-looking fluid that is vomited, but it is now well known that continued vomiting is generally bilious, even in cases where there is no ground for suspecting the secretion or discharge of that fluid to be in any way deranged. It is probable, that from some cause or other, the blood in the portal capillaries circulates sluggishly, and that congestion of the vessels of the stomach is secondarily produced.

The affection just described is said to be often the precursor of other diseases, such as fevers, jaundice, &c. and to be most common in hot weather. It is not of frequent occurrence in the natives of tropical countries, and when Europeans suffer, it is chiefly those who have newly arrived.

Treatment.—The bowels should be acted upon by moderately active aperients containing some mercurial preparation, and the diet restricted. Afterwards, should the symptoms not be entirely removed, three to five grains of blue pill with a grain of ipecacuanha, and three of the extract of taraxacum may be given at bed-time for two or three nights, and followed in the morning by a mild aperient.

CHRONIC DYSPEPSIA.—Derangement of the function of digestion, continuing for weeks or months, is of frequent occurrence, and often associated with general impairment of nutrition. It may be that, in a proportion of such cases, the derangement of the stomach is but a part of that disturbance of all the functions which arises from defective nutrition, and that therefore it hardly deserves to rank as a separate disease; but it is probable that in some instances at least, depression of the action of the stomach, or a diminution of its functional power, constitutes the basis of a distinct pathological state.

Symptoms.—The symptoms of chronic dyspepsia are subject to great variety in different persons. Stated generally, they are an altered state of the appetite, uneasy sensations in the region of the stomach, often accompanied by vomiting and sympathetic derangement of nearly every function. The appetite is generally impaired (anorexia), but it is sometimes voracious (bulimia). Instead of the healthy feeling of hunger, the necessity for food is made known by a sensation of hollowness or sinking at the epigastrium. After food has been taken, and often at other times, various uneasy sensations are experienced. In slight cases, perhaps, a feeling of fulness or distension is alone perceived; in others the uneasiness amounts to pain, which may be of a gnawing character. In the majority of cases there is no actual pain, but some kind of uneasiness at the epigastrium, which can scarcely be described, but which is said to be worse than pain. Sometimes there is pain of a spasmodic character, coming on at intervals (gastrodynia), and felt both when the stomach contains food and when it is empty. The symptoms due to derangement of the digestive process are numerous,—as eructations of fetid gases, of acid and acrid fluids, nausea, vomiting, &c. Occasionally the eructations are attended with a burning sensation in the course of the œsophagus, and at the cardiac orifice of the stomach (heartburn). In some instances a large quantity of transparent tasteless fluid rises into the mouth (pyrosis or water brash). Hiccup is often a troublesome symptom.

The patient generally loses flesh and suffers from secondary derangements. There is, indeed, scarcely an organ, the function of which is not liable to be disordered; at the same time, we must be careful not to mistake actual disease for functional derangement secondary upon dyspepsia.

The nervous system is very often affected, the patient being gloomy and despondent, or peevish and irritable—incapable of taking part in either the business or the pleasures of life,—sometimes his whole thoughts are fixed upon his ailments, which he is apt to exaggerate, and not unfrequently he fancies himself the subject of diseases which exist only in his imagination. The tension upon the mind is so great, that hypochondriasis and insanity are sometimes produced. He is often harassed with noises in the ears (tinnitus aurium), flitting of objects before the eyes (muscæ volitantes), headache and giddiness. Anomalous pains and irregular action of muscles are not at all uncommon. Sleeplessness is occasionally a very distressing symptom, and disturbed sleep and dreams are seldom absent. Derangement of the circulation of the blood is a common secondary or sympathetic derangement—the heart is apt to beat irregularly or violently (palpitation), or feebly, causing faintness. Cardiac irregularity, however, demands careful examination of the precordial region, as dyspeptic symptoms are in some cases the consequence of organic disease of the heart, and not the cause of its functional derangement. Respiration is not in general much affected; the breathing may however be oppressed, and a hard ringing cough with expectoration is common early in the morning.

The bowels are irregular—most frequently constipated, but sometimes loose, and occasionally looseness and costiveness alternate. The tongue is usually coated with a thickish fur, but is sometimes preternaturally clean and florid looking.

Progress.—The progress of dyspepsia is subject to much variety: sometimes the symptoms, after continuing for many months, suddenly cease, either upon a change of climate, upon the patient's adopting a different mode of life and habits, or indeed, without any apparent reason. In other instances, the derangement seems to become permanent, and all that can be done, is to relieve distressing symptoms. Dyspepsia is not directly dangerous to life, although, if of long continuance, it may verge into inflammation; and by interfering with assimilation and nutrition, may be the means of reducing the system to that state in which it is predisposed to be acted upon by the exciting causes of disease.

Causes.—The causes of dyspepsia are very numerous—sedentary employments, improper food, both as regards quantity and quality, rapid eating and imperfect mastication, laborious occupations, too close mental application, and depressed states of the mind, are the chief. To these may be added all those circumstances which induce a depressed or anæmic state of the system. Sudden changes in the kind and in the time of taking food, tobacco smoking in excess, the abuse of tea and coffee, a vegetable diet, are also mentioned amongst the causes.

Pathology.—The pathology of dyspepsia is not well understood, and so many dissimilar states have been classed together under this designation, that the subject is beset with difficulty. It may be viewed as a functional, in contra-distinction to an organic disease; that is, the derangement is not necessarily connected with any structural change which we are capable of demonstrating. Its pathology may be perhaps best elucidated, by considering it to consist in an alteration or deviation from the healthy standard of one or more of those things which are required for healthy digestion.

1. *Food.*—Too much food, or food which is not readily dissolved, at first increases the secretion of the gastric fluid, but afterwards, in consequence perhaps of the mucous membrane becoming congested, the secretion is lessened. The food remains for a time in the stomach—having undergone but little

change—and gives rise to various uneasy sensations and symptoms of functional disturbance. It is at length got rid of by vomiting, or passes undissolved into the intestinal canal. But even when the food is in proper quantity and of good quality, the gastric fluid may be unable to reach every portion, and thus dissolve the whole of it, by reason of its having been insufficiently masticated. This generally arises from the teeth being lost, and is therefore most common in elderly persons; but the same thing occurs in young people, from the bad habit of eating too fast. Rapid eating has the further disadvantage of preventing the admixture of the saliva with certain constituents of the food, without which their digestion is effected with difficulty. If the starchy constituents are not mixed with the saliva during mastication, their conversion into sugar does not commence until they reach the pancreatic fluid in the duodenum. The secretion of saliva does not seem to be often deficient, except in febrile conditions.

2.—*Changes in the gastric juice.*—The food, duly masticated and insalivated, may not be dissolved in the stomach, in consequence of the secretion of gastric juice being deficient. The albuminoid constituents then remain in the stomach undissolved, causing weight and uneasiness. Passing from the stomach into the intestinal canal, they are in part decomposed into fœtid gases—giving rise to flatulent distension—and in part expelled in the form of unaltered muscular fibre. The causes of deficiency of the gastric fluid are very numerous: as before mentioned, too much food, or its opposite too little food, certain mental states,—anger, grief, anxiety,—great mental or bodily fatigue, exposure to great heat or cold; to these may be added states of general anæmia however induced.

3.—*Defective action of the muscular coat of the stomach.*—Digestion in the stomach can only be completely effected when, by the action of the muscular coat, each portion of the food is so rolled over and over, that every part of its surface is brought into contact with the gastric fluid. In anæmia, or in certain conditions of the nervous system, the muscular power of the stomach is diminished, a portion of the food therefore remains undissolved, and symptoms are produced of the same kind as are caused by deficient secretion of the gastric fluid.

4.—*Deficiency of hepatic and pancreatic secretions.*—Lastly, the final act of digestion—the conversion of the chyme into chyle—may be delayed or interrupted in the duodenum by deficiency of the hepatic and pancreatic secretions.

Treatment.—In the treatment of dyspepsia, the first, and perhaps the most important point, is to remove the causes which are known to interfere with the digestive function. Moderate and regular exercise in the open air, falling short of fatigue, should be substituted for sedentary occupations in the house. Too much labour, whether of body or mind, should be restricted to moderate application; states of general anæmia should be remedied, and sources of mental anxiety if possible got rid of; acquired habits, believed to be injurious—as tobacco smoking, abuse of spirituous liquors, tea, coffee, and the like—must be discontinued. If the attack seems to have been excited by too much, or too little, or improper food, this must also be remedied, and care taken that the food is sufficiently masticated. In the further treatment, the following indications may be kept in view:—

1.—To diminish irritability of the stomach when present.
2.—To improve the tone of the stomach and general health.
3.—To relieve symptoms.

1.—When there is vomiting and tenderness at the epigastrium, a few leeches may be applied, followed by a sinapism. If the vomiting does not cease, small doses of dilute hydrocyanic acid, with bicarbonate of potass, or the sesquicarbonate of soda may be given; or the nitrate of bismuth, combined or not with opium. The diet should be restricted to milk and lime-water,—two-thirds of the former to one-third of the latter. When irritability has been removed, or should it not have existed, that regimen and those remedies should be prescribed which are calculated to give tone to the stomach and to the system generally. The food should be nutritious, small in quantity, and easy of digestion. It should be taken at fixed times and when the body is not fatigued, and active exercise after meals must be avoided. The use of stimulants must be left to the judgment of the practitioner, who, in this respect, will doubtless be guided by the previous habits of his patient. If taken at all, they should only be used at the time of meals. Those classes of persons in this country who never make use of alcoholic liquors, will not require them in the treatment of dyspepsia; but inasmuch as many of these classes substitute narcotic drugs, it will be for consideration how far they should be allowed. No fixed rules in this respect can be laid down. Cold bathing and the free use of the flesh brush have in general a good effect, in giving tone to the muscles and in promoting the various excretions. When, however, the use of the cold bath is followed by chilliness, it should not be persisted in. Regular and sustained exercise, adapted in degree to the strength of the patient, is of great importance; but it must be exercised in the open air, and so contrived, that the mind is at the same time pleasingly occupied; exercise in the house, or even out of doors, when it is unattended with mental exhilaration, is of little service. For delicate persons, gestation in a carriage is the most suitable; for those who are stronger, riding on horseback and walking are preferable. The bowels should be regulated by gentle aperients, of which aloes and rhubarb, and the tartrate of soda, are the best. Active cathartics should not be given. The secretions should be promoted, when deficient, by small doses of mercury with chalk, or of the mercurial pill or bichloride of mercury. The tone of the stomach may require to be excited and maintained by tonic medicines; but they should not be continued for any great length of time, nor used at all in some cases. When by suitable arrangement of diet, attention to the bowels and secretions, the food seems to be easily digested, tonics are not called for. The vegetable bitters,—quassia, gentian, and chiretta,—are those generally employed, combined or not with the mineral acids. The mineral tonics seem in some cases the most serviceable, and of them, the sulphate and the tincture of the sesquichloride of iron, the oxide and sulphate of zinc, are amongst the best. When there has been ground for believing that the indigestion was due to defective action of the muscular coat of the stomach, nux vomica, in doses of one grain of the powder, or half a grain of the extract, has been found useful. Strychnia may be substituted for the coarser preparation. Pepsine has been recommended when gastric juice is believed to be deficient.

The relief of painful and distressing symptoms is often a very important part of the treatment.

Vomiting.—Vomiting may often be allayed by restricting the food to milk and lime water. If this should not be sufficient, sedatives may be given, as small doses of hydrocyanic acid with sesquicarbonate of soda, but should these fail, creosote and oxalate of cerium may be tried.

Flatulent distension.—Flatulent distension is often relieved by carminatives, alkalies, and antiseptics.

Pain.—When pain comes on, the stomach being empty, it often ceases on a slight stimulant being taken, such as a few drops of sal volatile or a glass of wine. If it occurs directly after eating, it is probably due to the contact of the food with the mucous membrane, when bismuth or nitrate of silver are the best remedies. If it comes on two hours afterwards, it seems in many cases to arise from, or to be kept up by, a large secretion of acid fluid; alkalies are then indicated.

Pyrosis.—In pyrosis the compound kino powder often gives much relief.

CHAPTER III.

DISEASES OF THE INTESTINES.

DISEASES of the intestines constitute a very common and important class in tropical countries. It would, indeed, not be beyond the truth to affirm, that they cause more deaths than all other diseases combined.

COLIC.—*Paroxysmal pain of the abdomen not inflammatory.*—Colic is common, especially in children, and often traceable to irritating matters in the intestinal canal.

Symptoms.—The attack is generally sudden, and characterised by severe abdominal pain in paroxysms; which, so far from being increased, is often relieved by pressure; and on this account, the patient either lies on his belly so as to press it against the mattrass or bed, or sits up with both hands grasping the abdomen. The bowels are in general constipated, and there may be nausea and vomiting. The severity of the pain sometimes causes faintness, pallor, and cold sweats, and in children convulsions. Fever is absent. Colic is usually relieved by proper remedies or subsides of itself. If neglected or improperly treated, it may merge into inflammation.

Pathology and causes.—The pain of colic is due to spasmodic contraction of the muscular coat of the intestines, and is often excited by indigestible or irritating articles of food; by certain poisons, as lead; by exposure to cold, and obstruction of the intestinal canal.

ILEUS.—When obstruction is the cause, the symptoms are aggravated, vomiting is urgent, and the matters thrown up have after a time the appearance and odour of fæces, or of the contents of the small intestines, and are called stercoraceous. Should the obstruction not be removed, inflammation of the intestines sooner or later sets in. This may not, however, happen for many days, during which the vomiting continues, the abdomen becomes swollen, tympanitic, and painful from distension, and violent paroxysms of colicky pains recur at short intervals, in the height of which the convolutions of the intestines may sometimes be seen and felt in active peristaltic action. The paroxysms are occasionally very severe. There is in general no fever, and the pulse is but little accelerated and feeble; the skin is covered with cold sweat, and the face anxious. From vomiting, pain, and want of sleep, the patient loses flesh and strength with a rapidity which is proportioned to the height of the obstruction in the intestinal canal. The time that life may continue with complete obstruction varies, but from twelve to twenty days may be stated as an average. When the obstruction is in the small intestines, the symptoms are urgent and rapid in their occurrence and progress. When in the large intestines, and especially if low down in the rectum, constipation is at first the only marked symptom, and many days may elapse before the vomiting and general derangement come on.

Pathology of ileus.—In mild attacks, the constipation is caused by spasm or paralysis of the muscular coat of the intestine, and such cases may do well under appropriate treatment. Frequently, when the symptoms are severe, the obstruction is of a more permanent kind, and indeed, often such as cannot be removed. It may be—1*st*, stricture of a portion of the intestines from (*a*) strangulated hernia, (*b*) an adventitious band, the result of a former attack of peritonitis, (*c*) twisting of the mesentery; 2*nd*, organic disease (*a*) cancerous deposition, (*b*) lymph effusion from a low form of inflammation; 3*rd*, intusception or invagination of a knuckle of small intestine within another portion of it, so as to obstruct the canal; 4*th*, an intestinal concretion; 5*th*, hardened and impacted fæces.

Varieties of colic.—Colic sometimes occurs in persons who are hysterical or gouty, and it is possible that there may be a relation between it and those diatheses; but it does not present such peculiarity as to require separate notice.

Lead colic.—There is, however, one form of colic which must be carefully considered. It is caused by the introduction of lead into the system, and is known as lead colic, painter's colic, Colica Pictonum, and Devonshire colic. The two latter names are taken from the places—Poitou in France and Devonshire in England, where it has largely prevailed. Lead colic is a common disease in European countries, but not in India; the difference is probably due to the more free ventilation of the houses, and more sparing use of paint in the latter country. The only cases I have seen in Bombay—two in number—were in coach painters.

Symptoms.—The symptoms are in many respects similar to those of the more simple forms of colic. They usually come on more slowly, and for several days are of a somewhat anomalous character, consisting of fugitive pains in the abdomen, loss of appetite, and uneasiness of the epigastrium. The pain increases and becomes more characteristic; it is chiefly felt about the navel, but shoots backwards to the spine and radiates towards the chest above, and the pelvis below. It is a combination of rending, tearing, and grinding, and so agonising, that the sufferer is constantly moving about and changing his position, in the hope of obtaining relief. It sometimes extends to the muscles of the limbs, in which there are often cramps. Spasm of the respiratory muscles, and occasionally symptoms of angina pectoris, are said to occur. In many cases the testicles are retracted, and strangury and tenesmus are much complained of. The pain, though paroxysmal, is never entirely absent. The bowels are obstinately constipated, and the sphincter muscle is rigidly contracted. Nausea and vomiting are constant symptoms. The tongue is pale and flabby, and tremulous when protruded; the pulse usually slow and hard, but sometimes frequent, and the face of a dingy yellow or sallow appearance. Much light is often thrown upon the nature of the attack, by observing the tremulousness of the hands and the weakness of the carpal joint. A bluish gray line may also be sometimes seen along the margin of the gums.

The symptoms continue for several days, and sometimes disappear of their own accord; but their departure may be hastened, and in severe cases life can only be saved by prompt and decided remedies. The mortality from lead colic, if properly treated, is not great, and when death *does* occur, it is for the most part after long continued exposure and frequently repeated attacks, and is immediately caused by apoplexy or epilepsy. But though a fatal termination is rare, palsy of the hands, atrophy of the muscles, and general debility are often left.

Pathology.—Morbid anatomy has thrown no light upon this disease, none of the changes which are observed being present with such uniformity as to justify any other view than that they were merely accidental. The poison probably acts directly upon the muscular tissue, and causes suspension of its vital endowment. Its action on the muscles of the carpus and the muscular coat of the intestines appears to be identical. It also produces some change in the nervous filaments, which being afterwards extended to the centres, explains the epilepsy or apoplexy which is usually the immediate cause of death.

Causes.—The cause of lead colic is implied by its name. The lead may enter along with the food and drink, especially the latter, as when water is conveyed in leaden pipes or acid drinks (cider) are kept in leaden vessels. It may also be received through the lungs or skin. Thus, persons sleeping in rooms or houses which have been newly painted are often attacked. The vapour of melted lead is very efficient in causing the disease. Painters who are careless in washing off the paint from their hands often suffer, and all persons who are employed in lead manufactories, or use lead in any form, are liable to be attacked. The disease has sometimes been thought to be epidemic, but whenever a number of persons have been seized at or about the same time and place, some local cause, for the introduction of lead into the system, has sooner or later been discovered; there is no reason to believe that the disease called "lead colic" has any other cause.

Treatment.—The treatment consists in the administration of an opiate to relieve pain and the contraction of the sphincter muscle, and purgatives to remove constipation and promote the elimination of the poison. Two grains of opium, combined with five or ten of calomel, may be taken, and followed in three or four hours by a dose of castor oil or of senna and salts. These means failing, the calomel and opium may be repeated, and more active purgatives, such as jalap or croton oil, given. Large warm water enemata should be used, and in obstinate cases turpentine or tobacco injections tried. The warm bath is often useful, and fomentations to the abdomen always give relief. Certain medicines—alum and iodide of potassium—are believed to have the power of neutralising the poison, by entering into combination with it or decomposing it; of the former, three or four drachms may be given in the 24 hours, and of the latter from five to twenty grains three times a day. As a means of eliminating the poison, a sulphur bath, made by dissolving sulphuret of potassium in water, has been found very useful. Persons whose occupations require them to use lead, should pay great attention to cleanliness.

Treatment of colic and ileus.—In simple colic, a carminative sedative, and an hour or two afterwards a cathartic will be sufficient; or the treatment may be commenced with a cathartic. When the pain is very severe, forty or fifty minims of tincture of opium or morphia are to be given. Relief is sometimes obtained from large enemata of warm water, and from fomentations to the abdomen. In those forms of colic which are related to certain diatheses—as the hysterical—remedies adapted to the diathesis must be administered. Should the constipation continue, and especially should there be stercoraceous vomiting (ileus), a most careful examination must be made of every locality where it is possible for a hernial or other tumour to be detected. Both groins, the upper part of the thighs, the navel, the neighbourhood of the thyroid foramina, and in females the vagina are to be rigidly scrutinized. The finger should be passed into the rectum, to ascertain if there are hardened fæces, an intestinal concretion, stricture, strangulated piles, or other disease of the coats of the intestine. Nothing being found, it should be determined, if possible, whether the obstruction is in the small or large intestines. If in the small intestines, the patient will most likely be under middle age, and the symptoms acute and severe; and if the impediment is high up, the vomiting will usually be very urgent, and the secretion of urine diminished. Sometimes the patient will himself direct attention to a particular spot, down to which he perceives that flatus passes, but not beyond it, and there may be a swelling or tumour there. When the obstruction is in the large intestines, the symptoms are chronic, and for many days there may be none besides constipation of the bowels. The patient is generally advanced in life. A careful examination will often detect organic thickening in some part of the rectum, or a solid tumour in the course of the large intestine. Should it appear probable that the obstruction is in the small intestines, it is important to ascertain its nature. If the symptoms of obstruction, though acute, have been preceded by colic, which has appeared slowly to merge into them, spasm or paralysis may be suspected, in which case we may have recourse to the warm bath and opiates, followed by cathartics. In very robust persons, blood may be taken from the arm, and in severe cases, the tobacco enema administered with much caution. These measures having been used without success, the existence of paralysis may be inferred, and more active purgatives given, enemata administered, and galvanism tried. If under the use of purgatives the intestines can be seen in violent peristaltic action up to a certain point but not beyond it, more permanent obstruction should be apprehended, and the purgatives discontinued. When the symptoms come on suddenly, and resemble those of strangulated hernia, it is probable that there is internal strangulation, either by an adventitious band or by twisting of the mesentery. Purgatives would seem to be contra-indicated in cases of this description, but inasmuch as we cannot be sure that the obstruction is thus induced, they should be cautiously tried, and large enemata thrown up, by introducing an elastic tube as high as possible into the rectum. When along with the symptoms of obstruction there is muco-serous discharge from the rectum, intus-susception is to be suspected. This is not uncommon in children. In such cases, large enemata should be injected and repeated, in the hope, that by distending the lower part of the intestines, the invaginated portion will be drawn out. Purgatives may be cautiously tried, but should they not soon give relief, opium is to be substituted. When the obstruction is in the large intestine, the essential part of the treatment is the use of purgatives. The milder are first to be selected, and followed by those more active, until at length the most powerful are given.

When all ordinary treatment has failed in obstruction of the bowels, we are not to despair, for the most desperate cases have sometimes recovered. Other means having failed, opium should be given and repeated at moderately short intervals, and enemata admimistered two or three times in the day, and it may be as well that they consist of some nutritious fluid, such as milk or chicken broth. Injections of air may be tried. The question will arise, can anything be done by a surgical operation? There are two operations which may be, and indeed have been, performed. When the obstruction was in the large intestine, the cœcum and descending colon have been opened from behind without wounding the peritoneum, an artificial anus being established; the result has not been very encouraging. In the greater number of cases the patients died, either from the original disease, or from the aperture closing; still, there can be no doubt, that life was in some instances prolonged. Few, if any, died from the effects of the operation. When the obstruction is in the small intestines, the operation is of a different kind. It aims at a perfect cure. The abdomen is to be cut into, the obstructed portion of the intestine sought for, and the cause of the obstruction removed. It is a terrible proceeding, and if attempted at all, it should alone be after all other measures have failed, and time even has afterwards been given to see what nature herself may effect. If there is no clue to the situation and nature of the obstruction, operative interference should be deprecated; but if from the presence of swelling, or from the patient's sensation, that at a certain spot everything is obstructed, or from observing the peristaltic action to be active up to this spot, but not beyond it, the seat of the obstruction seems tolerably evident, and if, moreover, there is reason to believe that the obstruction is from an adventitious band or intus-susception, the question of operation should be considered. If the patient is intelligent, or has intelligent friends, the danger of the operation should be pointed out, and at the same time the desperate nature of the disease; they, or the patient himself, should be left to decide whether it is to be performed or not.

ENTERITIS.—*Inflammation of the peritoneal, and one or more of the other coats of the intestines.*—*Symptoms.*—The symptoms of enteritis require but brief notice. They are those of peritonitis and colic combined—that is, with tenderness of the abdomen, more or less febrile disturbance, a pinched and anxious face, and a frequent and contracted pulse, there are attacks of paroxysmal twisting abdominal pain, and constipation of the bowels. Nausea and vomiting are in severe attacks common and often distressing symptoms. The pulse, at first full, soon becomes small and wiry, or thready. If the disease is not checked, the abdomen becomes swollen and tense, and the paroxysms of pain severe; the pulse is very feeble and irregular, the skin cold and clammy, and death takes place in the way of asthenia. Not unfrequently, a short time before death, the pain suddenly ceases. Between colic, ileus, and enteritis there is a close relation: colic unrelieved often becomes ileus; and ileus unrelieved will certainly sooner or later become enteritis; but the latter may occur as a distinct and separate disease, and it then sometimes resembles colic, from which it is necessary to distinguish it. By noticing that the pain, though paroxysmal, is never altogether absent; that it is increased by pressure; that the patient lies on his back with his knees drawn up, and that his face is pinched and anxious, a correct opinion can always be formed.

Causes.—The causes of enteritis are all those that have been mentioned under the heads of colic and ileus. It may, however, be produced by the ordinary causes of inflammation, such as cold, errors in diet, and violent purgative medicines. Blows on the abdomen are also capable of exciting it.

Pathology.—The inflammation may be limited to the peritoneal and the cellular and muscular coats; or it may extend to all the tunics at the part affected, which is often of limited extent. The effect of such inflammation is to paralyse the muscular coat, and consequently to impede the passage of the contents of the intestinal canal. Hence, in enteritis, constipation of the bowels is almost a constant symptom.

Morbid appearances.—The parietal and visceral layers of the peritoneum are reddened in patches, and covered more or less extensively with lymph. The convolutions of the intestines are agglutinated. In some cases they are of a black colour and softened from gangrene. That portion of the canal which is above the inflamed part is distended; that below it contracted. In the former the appearances of inflammation are the most marked.

Treatment.—The treatment of enteritis is very similar to that which was detailed under peritonitis (page 166). In the early stage in sthenic persons, blood must be drawn either generally or locally, or in both of these modes; afterwards opium, or calomel and opium should be given in moderate doses, and repeated at intervals of three or four hours, until the gums are slightly tender, or the symptoms subside. In asthenic persons, local bleeding should be alone employed; the calomel had better be withheld, and opium alone given. When enteritis is due to mechanical obstruction, nothing can be gained by the use of calomel, until the obstruction is removed. During the treatment, the abdomen should be frequently fomented and stuped with turpentine. In the advanced stages of the disease, when the skin becomes cold and clammy, and the pulse feeble, stimulants are to be freely given, and they are said to have been sometimes successful in cases which were very unpromising. Purgatives are not to be used in enteritis, until the inflammation has in some degree subsided, and then they may not be required, as the bowels often act without them. Large warm water enemata may be thrown up at any time; they clear out the lower part of the gut, and the warm water seems to have a soothing effect on the inflammation.

DISEASES OF THE MUCOUS MEMBRANE OF THE INTESTINAL CANAL.

Disease of the mucous membrane of the intestinal canal bears much the same relation to hot, that disease of the chest does to cold, climates. A predisposition to it exists in a very large proportion of the lower classes of the people in all parts of India.

Inflammation of the mucous membrane of the intestines excites the action of the muscular coat; the contents are consequently propelled rapidly through the canal, or, in other words, the patient is purged; the secretions from the mucous surface are increased and perverted—serum, blood, and even pus being discharged in the evacuations. When a considerable extent of the membrane is involved, absorption is interfered with, and emaciation produced; lastly, febrile disturbance is a very common accompaniment.

The morbid appearances are redness in points corresponding to the villi, and in patches or zones around the follicles; swelling from effusions into the sub-mucous tissue, opacity from lymph deposits, softening, ulceration, and gangrene. The solitary and Peyer's glands in the ileum sometimes stand out, having a vesicular or pustular appearance.

Inflammation of certain portions of the intestinal canal have received different names.

Muco-enteritis.—Muco-enteritis signifies inflammation of the mucous membrane of the intestines; and when it is caused by an irritant poison, the whole surface is generally involved. It is usual, however, to restrict this term to inflammation of the small intestines, and chiefly of the jejunum and ileum.

Acute Muco-enteritis.—Acute muco-enteritis in adults is common in malarious fevers, the exanthemata, and in cachectic or anæmic states of the system however induced.

Symptoms.—The symptoms are abdominal soreness and frequent calls to stool,—the evacuations being passed without tenesmus, but with slight griping, and consisting of thin feculent matter mixed with mucus, and sometimes blood. The tongue is florid, and there is usually slight febrile excitement. In grown-up persons, the symptoms generally cease upon the removal of the disease with which the muco-enteritis is associated, and under any circumstances it is not for the most part a very severe affection. In children, however, it is far otherwise; during dentition it is a very common and serious complication.

Symptoms of muco-enteritis in children.—It sets in with what appears to be a simple purging, or sometimes with vomiting and purging; the child soon becomes restless and feverish, and the evacuations are found to consist of a reddish brown muc~~o~~us, or of pale-coloured pasty-looking feculence, or of a dark, watery, or greenish-looking gelatinous matter. The abdomen is tense and tumid ; the tongue florid at the tip and edges, but thickly coated in the middle ; the face anxious, the pulse frequent, and the skin above the natural heat. The evacuations assume various appearances in the course of the attack, being serous, tinged red, or of a dirty green colour, without either mucous or blood, or feculent streaked with mucous and blood, or containing blood in considerable quantity. Head symptoms are not uncommon—drowsiness, or even stupor, with drawing inwards of the thumb and great toe, or even muscular twitchings threatening convulsions, are sometimes observed. As the disease advances, the tongue becomes dry, and the child craves for cold water; emaciation is very rapid. In the progress of the symptoms there is much fluctuation: cases now and then occur where death happens within two or three days, or even in a few hours; generally, however, at the end of a day or two, there is a subsidence of the more serious symptoms, which is sometimes followed by recovery, but more frequently the disease returns, though somewhat modified. In this way the child's life may be prolonged for many weeks, at the end of which it may sink exhausted ; or there may be a slow convalescence and ultimate recovery. As the diseases of children are not included in this work, a more detailed account of this affection would be out of place. The student may refer with profit to Dr. West's Treatise.

Pathology.—Some pathologists distinguish two forms of muco-enteritis :—1. Simple inflammation of the mucous membrane, produced by the ordinary exciting causes—as exposure to cold, irregularities of diet, irritants, purgative medicines, and the like. In this form the whole membrane is involved. 2. Specific inflammation induced by poisons introduced into the system, as in contagious or malarious diseases. In this form the inflammation is believed to be confined to the follicles and glandular structures. It is the first of these forms that now engages our attention. The second form will be more conveniently discussed in connection with the diseases of which it is a complication. In fatal cases, the appearances in the intestines are very similar to those in the stomach in acute gastritis: there is more or less redness, swelling, and opacity and softening of the mucous membrane, which is covered with a thin, serous, and often tenacious fluid; ulcers are sometimes seen.

Causes.—The most common predisposing cause is general debility. A proclivity to muco-enteritis seems also to be given by hepatic inflammation, malarious fevers, the exanthemata, phthisis, typhoid fever, &c. The exciting causes are irritant poisons, irritating and indigestible articles of food, purgative medicines, and the ordinary exciting causes of inflammation. In children there is a striking relation between muco-enteritis and teething; and this seems to exist in a marked degree in tropical countries.

Treatment.—In adults, leeches, in number proportioned to the strength of the patient, should be applied to the most tender part of the abdomen, followed by fomentations and turpentine stupes. The diet should be farinaceous. Small doses of ipecacuanha and opium should be administered, and if the evacuations are copious, and the more acute symptoms subdued, a mild vegetable astringent may be added. If the evacuations are very scanty, small doses of blue pill, or of mercury with chalk, may be combined with the ipecacuanha, and the opium discontinued. Chronic muco-enteritis will be considered as a form of chronic dysentery.

Duodenitis.—It is said that inflammation is sometimes limited to the duodenum, but very generally duodenitis is associated with gastritis. The symptoms are by no means characteristic, but it is believed to exist when, along with the symptoms of gastritis, there is jaundice. Jaundice, with tenderness in the epigastrium, and beneath the ribs of the right side, is very common in remittent fevers, without any evidence of enlargement of the liver. Hence, possibly, the duodenum may be inflamed; but as such cases are not fatal, I have had no opportunity of verifying this. I must confess, that neither from reading nor observation have I been able to gain any clear idea of duodenitis as a distinct affection.

Colitis.—Dysentery.—Inflammation of the mucous membrane of the Large Intestines.

Dysentery prevails to a greater or less extent in all parts of the world, and has been at times the cause of great mortality in fleets, armies, and jails. Amongst the general population, however, in temperate climates, it is of comparatively little severity. The importance and prevalence of dysentery in India, will be apparent from the following tables, extracted from Dr. Morehead's Clinical Researches :—

	Europeans.			Natives.		
	Per-centage of Admissions to strength.	Per-centage of Deaths to strength.	Per-centage of Deaths to Admissions.	Per-centage of Admissions to strength.	Per-centage of Deaths to strength.	Per-centage of Deaths to Admissions.
Bengal	30·41	2·02	6·65	6·18	·173	2·80
Bombay	27·13	1·71	6·30	6·57	·196	2·98
Madras	23·43	1·24	5·30	3·08	·190	6·17

	Per-centage of Deaths from Dysentery and Diarrhœa on treated.	Per-centage of Deaths from Dysentery and Diarrhœa on aggregate Mortality.
European General Hospital, Bombay (Dysentery)	18·3	24·1
European Officers, Bombay Presidency	....	5·7
Jamsetjee Jejeebhoy Hospital....	38·9	21·8
General population of Bombay ..	....	13·50

In the three Presidencies of India—Bengal, Madras, and Bombay—in a period of 5 years, out of 87,375 soldiers, 13,670 suffered from dysentery and 1,121 died. Between the years 1830 and 1850, 2,044 cases of dysentery were treated in the European General Hospital at Calcutta, with a mortality of 457, or 22·3 per cent. The deaths in Bombay during the year 1862 from dysentery and diarrhœa were 1,190.

Dysentery may be *acute* or *chronic*, *idiopathic* or *secondary* upon other diseases—as fevers and hepatitis. It may occur in sthenic or asthenic persons, be limited to one or a few persons, or simultaneously attack large bodies of men; show itself in a mild form in which there is little danger, or as one of the most destructive and dangerous diseases we are called upon to treat.

Symptoms.—The symptoms of acute dysentery stated generally, are more or less frequent calls to stool, with griping and straining; the passage of blood and muc~~o~~us, either mixed or unmixed with fæcal matters; febrile disturbance varying much in degree, and usually tenderness in some part of the abdomen.

In considering the symptoms in detail, it will be expedient to treat separately of the disease, as it occurs in sthenic and asthenic persons.

Acute dysentery in sthenic persons.—There are several modes in which it may commence.

1*st.*—It may set in as a simple diarrhœa, which, continuing from a few hours to a day or two, the evacuations become scanty and more frequent, are passed with more griping and some degree of straining, and upon inspection, are found to consist of, or to contain, muc~~o~~us and blood.

2*nd.*—The attack commences with a discharge of blood. This is said to be common in the Bengal, but is very rare in the Bombay Presidency.

3*rd.*—The bowels are at first constipated, and the evacuations consist of scybala streaked or mixed with muc~~o~~us or blood.

The disease once established, the calls to stool increase in frequency, and griping and tenesmus become more severe. The appearance of the evacuations depends in some measure upon the part of the colon which is affected: if the lower part, they are gelatinous looking, mucous, clear, and transparent, or mixed with blood; if the transverse colon or cœcum, the mucous and blood are mixed with more or less feculence, or the evacuations may be thin shreddy mucous and blood alone. At this early stage, the evacuations have sometimes a slimy oil-paint appearance, of a yellowish or greenish colour, streaked or speckled with little patches of blood. In general, soreness and heat of the abdomen, aggravated by pressure, are complained of; or there may be well-marked tenderness in certain situations, by which the extent of the disease can often be determined. Thus, it may be limited to the right or left iliac regions, or extend throughout the whole of the colon. Nevertheless, even in the worst attacks, there is sometimes at first no distinct tenderness, and the absence of this must on no account lead to an underestimate of the severity of the disease. Deranged function of one or more of the abdominal organs, as nausea, vomiting, and dysuria, is not uncommon. The biliary secretion is so often affected—as evidenced by jaundice—that the term "hepatic" has been used to signify a distinct form or species of dysentery. The tongue is often much furred. The general symptoms vary much in different cases. In some, fever is well marked; in others it is so slight at the commencement, and even for some time afterwards, as to attract little notice. When it is so severe as to be out of proportion to the severity of the local symptoms, a malarious origin may be suspected.

As the disease makes progress, the evacuations become more watery, and contain dark, thin, feculent matter, with clots of blood, and white shreddy-looking films or patches of sloughy tissue. At a still more advanced stage, the watery discharges often have a peculiarly offensive smell, and are tinged red, so as to resemble the washings of raw meat. The constitutional disturbance is now severe; there are distinct febrile accessions, or the skin is continuously hot and dry, and the pulse quick and sharp, or the skin may be covered with perspiration, and the pulse weak and compressible. The abdomen becomes swollen and tympanitic; the tongue dry and brown; delirium sets in, and the patient sinks, the duration of the attack varying from ten to twenty-five days. Occasionally the disease runs its course within two or three days, the inflammation rapidly passing into gangrene. Such cases may often be recognised by the disagreeable fetor which is exhaled from the patient's body, by coldness and clamminess of the skin, a sunken countenance, and feeble and rapid pulse.

In favourable cases the stools become less frequent, and the griping and tenesmus less severe, the evacuations contain more feculence, and less mucous and blood, and tenderness of the abdomen, and fever, if present, disappear. In less favourable cases, after the symptoms have been somewhat subdued, the calls to stool continue to be frequent; the evacuations becoming more copious, consist of thin feculence, streaked or mixed with mucous and blood, and are passed with griping, but without straining; the tongue becomes florid and glazed, and the patient loses flesh. The *acute* has now passed into *chronic dysentery*.

Dysentery in asthenic persons.—In asthenic persons, the disease often involves the whole length of the colon, but may be limited to the upper part; it is seldom confined to the lower part. The calls to stool are usually less frequent than in sthenic persons, and the evacuations are more copious and feculent, the mucous and blood being intimately mixed up with the feculence. Sometimes there is grumous or florid blood in considerable quantity. There is much griping, but tenesmus is not in general a marked symptom. The abdomen is tender in the course of the colon, but there is not the general soreness which is so common in the sthenic variety of the disease. The tongue is florid at the tip and edges, and sometimes all over, and the pulse frequent, small, and easily compressible. Febrile heat is not a prominent symptom, but an accession of fever will usually be observed towards evening. The constitutional symptoms in asthenic dysentery are often related to the degree of the asthenia and the severity of the attack. They are frequently adynamic, viz. sordes about the teeth, a dry tongue, low muttering delirium, petechial spots, &c. These are common in the scorbutic and cachectic states which result from over-crowding, impure air, and insufficient food, and are therefore frequent in jails, camps, and crowded cities. In the course of asthenic dysentery, local or general abdominal tenderness sometimes sets in suddenly, and is due to the supervention of local or general peritonitis.

Pathology.—Dysentery is inflammation of the mucous membrane of the large intestines, and may involve one or more or all of the structures which enter into the formation of that membrane. Whether the local disease is simply the manifestation of an antecedent derangement or alteration of the blood, or of the presence in that fluid of a poison, which seeks elimination by the intestinal mucous membrane, is a speculation upon which, however plausible, the present state of Pathology does not throw much light: we must therefore be content to regard and to treat dysentery upon the same general principles as other local inflammations. Attempts have been made to localize the inflammation in the glandular structures, but they have not met with the approval of the best observers. A comparison has also been instituted between diseases of the skin, and the changes which take place in the mucous membrane in dysentery.

Morbid appearances.—Patches of redness, varying much in colour, size, and appearance, are found on the lining membrane of the large intestine, and exudation varying from a thin layer to a membrane two or three lines in thickness. In the early stage, the exudation can be raised from the surface in the form of flakes, exposing the membrane below, which is of a red colour. It has sometimes a continuous or uniform surface, at others it is described as being mammilated. Under the microscope, exudation can also be detected in the tubular structures which open upon the mucous membrane. Sometimes the lymph exudation is in the form of shreds, and at others of granules. The latter appearance is chiefly observed in chronic dysentery. Numerous dark-coloured slightly depressed points are visible, which are mucous follicles filled with exudation, forming little circles; around these points are zones of redness, consisting of dilated capillary vessels. At a later period of the disease, the situation of the points and zones is occupied by circular ulcers. Scattered over the membrane are raised white bodies, sometimes as large as a pea, and presenting a vesicular or pustular appearance. These are solitary glands filled with exudation; some of them appear to have burst, and discharged their contents, being converted into circular excavations, which may increase in size by sloughing or ulceration. In some instances, the whole morbid change is restricted to these structures.

But the most important and characteristic appearance is due to the presence of ulcers, the size, depth, and appearance of which are very various. Some are elongated in the transverse

Is it correct to limit ulceration to exudation matter & to consider the mucous membrane from the

diameter of the intestine, others are circular. Sometimes the transverse and circular ulcers run together, and give rise to patches of irregular shape. In size the ulcers vary from a mere point to an inch or more in diameter. In depth they may be limited to the thickness of the exudation, the base being formed by the surface of the mucous membrane; or they may extend in part or wholly through the latter membrane, exposing the muscular coat. Occasionally, though rarely, *all* the tunics are perforated. The ulcers sometimes look as if a piece of the membrane had been punched out, the edges being clean, sharp, and well defined; at other times the edges are irregular, and appear as if eaten away. The base of the ulcer may be occupied by a slough, or this having separated, the muscular or even the peritoneal coat may be visible. The manner in which ulcers form in dysentery has been a good deal discussed. The transverse ulcers seem to arise from inflammation of the summits of the folds into which the intestine is thrown by the spasmodic contraction of the muscular coat. The circular ulcers may originate in the solitary glands or mucous follicles, or from suppuration in the sub-mucous tissue, the layer of membrane above having afterwards sloughed. Ulcers are met with in various stages of cicatrization, and sometimes the cicatrix is complete. It presents a pinched appearance, and is often of a grayish colour.

In cases of dysentery, which have run their course with great rapidity, the mucous membrane will be found in a state of gangrene; shreds or even tubular portions of the membrane are wholly or in part separated, and sometimes pass off in the evacuations.

It is by no means uncommon to find the peritoneum involved in the inflammatory disease; sometimes the whole membrane is vascular, and in places covered with flakes of lymph, the sac being filled with sero-purulent fluid; or in other words, there may be the usual morbid appearances of acute general peritonitis. This inflammation is sometimes caused by a perforating ulcer, but often no such cause is in existence. In many cases the peritonitis is local, and may be confined to matting of the omentum to the transverse or other portions of the colon, or to other viscera, and the walls of the abdomen. Every now and then the colon is displaced by adhesion of the omentum to the cœcum or lining of the iliac fossa.

The morbid appearances in dysentery are not always limited to the large intestines. Peyer's glands in the ileum are not unfrequently the seat of circular ulcers, and enlarged mesenteric glands are often met with.

The association of hepatic abscess with dysentery is an important point in its pathology. The fact of the frequency of their association is well established, but the relation they bear to one another has not been satisfactorily determined. That absorption by the portal veins of noxious or poisonous matter from the ulcerated intestinal membrane, may be the cause of abscess in the liver is generally admitted, but dysentery perhaps as frequently follows as precedes the hepatic disease, and consequently some other relation must be sought for. + It is very difficult to conceive that any altered condition of the biliary secretion can be a cause of dysentery, seeing that its action would be rather on the small than on the large intestines. It is probable, putting out of consideration hepatic abscesses, which have a pyœmic origin, that the two diseases do not stand in the relation to one another of direct cause and effect, but rather that the cachexia, which either one of them may produce, is a state predisposed to the occurrence of the other, under its ordinary exciting causes.

The influence of cachectic states of the system, however induced in determining the prevalence and severity of dysentery, must on no account he overlooked.

Diagnosis.—Dysentery must be distinguished from diarrhœa. There is in general no difficulty in making the distinction: the character of the evacuations, the tenesmus, tenderness of the abdomen, and febrile disturbance will leave no doubt of the nature of the attack. But it not unfrequently happens in asthenic dysentery, that the evacuations are copious and feculent, passed with little or no tenesmus, and though containing mucous and blood, these are so mixed up with the feculence, as to escape observation. Such cases might be, indeed often are, mistaken for diarrhœa. By careful examination of the adomen, tenderness will in general be detected; the pulse will be above the natural frequency, with a tendency to further acceleration

Ballingall believes Dysentery to be (particularly in old Indians) an indication of blood-poisoning. + I believe that it results from towards evening; there will be gradually increasing emaciation and persistence of the symptoms. The duration of the disease, and the little effect upon it of astringent remedies should also be taken into account.

Prognosis.—In forming a prognosis, we must consider the extent and stage of the inflammation, the patient's constitution, and the nature of the exciting cause. When the disease is in the early stage, and the inflammation limited to the rectum and sigmoid flexure of the colon, a favourable termination may in general be looked for, but it is always necessary to remember, that the inflammation may spread upwards. When the greater part or the whole of the colon is involved the danger is great. The longer the disease has existed without relief of the symptoms, the more serious it becomes. After the twentieth day the prognosis is very doubtful. A tympanitic abdomen, copious serous evacuations, tinged red or mixed with clots or dark-coloured blood, a florid tongue, harsh clammy skin, and a frequent pulse, are symptoms which show that the inflammation has passed on to some of its results, and are consequently to be viewed with much anxiety. When dysentery prevails epidemically in jails or camps, it is often of a very severe or fatal character.

Causes.—The causes of dysentery are *predisposing* and *exciting*. Predisposing causes are all the circumstances that produce a cachectic state of the system (page 91). In tropical countries, few of these causes are wanting, but there are two which do not exist to anything like the same degree in temperate climates, viz. malaria and heat. Persons living in malarious districts, or who are recovering from malarious fevers, are very liable to dysentery. It is doubtful how far exposure to a high temperature has a peculiar influence, distinct from its powerful effect, in causing cachexia. In all climates or countries, dysentery is a common and destructive disease, whenever cachexia is present, whatever may have been the cause of it.

The effect of cachexia, in predisposing to dysentery, has been abundantly proved, whenever large bodies of men have been collected together under circumstances such as are calculated to produce it. The outbreak of dysentery is often so general, that it has often been ascribed to some epidemic influence.

A predisposition to dysentery amongst persons lately arrived in tropical countries, seems to be produced by a want of adaptation of food and habits to the altered assimilation and elimination caused by climate.

Exciting causes.—Of all the exciting causes, cold is by far the most general and efficient; or rather it would be more correct to say, all the circumstances which have the power of depressing the temperature of the surface of the body, as for example, a moist atmosphere, cold currents of wind, &c. These act chiefly upon the predisposed, and when the predisposition is great, a very slight exciting cause is sufficient. In considering cold as a cause of disease in tropical countries, it must be taken in connection with the diminished power of generating animal heat, which is the result of continued residence in a hot climate.

Malaria is thought to be a direct or exciting cause of dysentery, as it is of ague; but this is at least doubtful.

Indigestible food, unripe and acid fruits, and acid liquors in large quantities, may be enumerated amongst the exciting causes, to which may be added the abuse or unreasonable use of purgative medicines.

Treatment.—In mild cases, little is required beyond rest in the recumbent posture, a farinaceous diet, and an oleaginous or other laxative. In others, a degree more severe, a few leeches should be applied over the sigmoid flexure of the colon, and the laxative preceded by five or six grains of blue pill, combined with one to three grains of ipecacuanha. Slight cases of dysentery must however be carefully watched, and active measures promptly adopted should severe symptoms be developed. It must never be forgotten, that the early symptoms of very serious attacks of dysentery, are often to appearance of a very mild nature.

Before commencing the treatment of severe forms of dysentery, it is to be determined—1*st*, whether disorganization of texture has or has not occurred; 2*nd*, the degree in which the patient may be sthenic or asthenic.

Treatment before disorganization.—We may assume, that disorganization has not commenced if the disease is of only a few days' duration, the evacuations not serous, the abdomen not very tympanitic, and the tongue not florid; and we shall be confirmed in this belief, if the patient's health has not suffered from previous disease or long residence in a tropical climate. This point being determined, the indications of treatment are the same as in other inflammatory diseases; viz. 1, to diminish general and local vascular excitement, and to prevent further lymph deposit; 2, to bring about re-absorption or removal of the lymph which has been effused, without the occurrence of organic thickening, ulceration, or gangrene. Within the first few days, in sthenic persons, the pulse being full and firm, venesection should be practised, and afterwards leeches applied to the most tender part of the abdomen, followed on their removal by fomentations. In less sthenic persons, leeching should be alone employed, and in very asthenic persons, even this is unadvisable—a more or less supporting treatment in such persons being necessary from the commencement of the attack. No precise rule can be laid down as to the extent to which the abstraction of blood is to be carried. This must be determined by the constitution of the patient, and the duration and severity of the disease. It may however be stated generally, that venesection is called for in sthenic persons who have newly arrived in a tropical country, and that in the older residents and natives of the country, its adoption is neither requisite nor justifiable. The number of leeches which should be applied, must likewise be left to the discretion and judgment of the practitioner, it being remembered that leeches differ much in the quantity of blood they are capable of drawing.

After blood letting, medicines should be given which, by acting upon the secretions of the liver and small intestines, favour the passage of blood through the portal vein, and thus tend to keep up free circulation in the vessels of the large intestines. In persons of good constitution, a pill of ten grains of calomel, combined with two to four grains of ipecacuanha, and one grain and a half of opium, should be prescribed at bed-time; and on the following morning from four to six drachms of castor oil. This pill and the castor oil may be repeated once or twice if the tongue be loaded, the belly tumid, and the evacuations scanty and unmixed with the secretions from the upper part of the intestinal canal. Should the general appearance of the patient, and other circumstances, contra-indicate the use of calomel, blue pill may be combined with the ipecacuanha and opium. The general and local vascular excitement having been in some degree subdued, and the biliary and intestinal secretions freed, peristaltic action in the small intestines, and free secretion should be promoted, by giving at intervals of from four to six hours, from three to five grains of blue pill, two to five or six grains of ipecacuanha, and three grains of extract of gentian. The blue pill is not to be continued sufficiently long to produce salivation, for this is to be carefully avoided; nor should it be given at all in weakly cachectic persons. When the calls to stool are very frequent, and the evacuations not scanty, it is proper to add from half to three quarters of a grain of opium to each dose. Should, however, the stools become more scanty under its use, and the abdomen full and tumid, it must be omitted. The administration of purgatives and laxatives is to be guided by the state of the discharges and abdomen; the former being scanty, and the latter full and tumid, would be an indication for their employment. The necessity for having recourse to them, may however sometimes be obviated, by lessening the quantity of opium, and increasing that of the ipecacuanha. When the calls to stool are very frequent, the tenesmus urgent, and the nights sleepless, relief is often obtained by using an opiate enema or a suppository. It need hardly be remarked, that the patient should be confined to bed, and his diet, except in very asthenic cases, restricted to sago, milk, and arrowroot.

Treatment after disorganization.—When, from the duration of the attack, the tympanitic state of the abdomen, the serous or copious, feculent and slimy nature of the discharges, the florid and glazed tongue, there is reason to believe that disorganization has commenced, the treatment requires much judgment and careful watching. It must never be forgotten, that the patient is to be conducted through a long process of repair, in the accomplishment of which all the powers of the system will be required. The indication, as stated by Dr. Morehead, is very simple, viz. "to place and maintain the part affected, and the system generally, in the conditions most favourable to growth and nutrition." If from circumscribed tenderness and fulness in some part of the abdomen, much tenesmus, and perhaps a tendency to febrile disturbance, there is reason to believe that inflammation still lingers around the disorganized portion of membrane, it may be necessary to use leeches or counter-irritation; but they must be carefully apportioned to the degree of asthenia. Inflammation having been checked, we are to place the patient in the most favourable circumstances for the process of repair to be effected. His diet should be nutritious, without being stimulating: milk, boiled rice, half boiled eggs, sago and arrowroot, and as improvement goes on, animal broths will be the most suitable. He should be confined for the most part to the recumbent posture in a well-ventilated room. If the purging is frequent and the stools are copious, it must be restrained by astringents and opiates. In recent cases, gallic acid with dover's powder should be given, and at a later period, the nitrate of bismuth, acetate of lead, or sulphate of copper. But unless the frequency of the purging and the copiousness of the stools are adding to the weakness, astringents should be cautiously used. Besides those mentioned, many other astringents are employed. They often require to be varied, and experience alone in some instances will decide which is the most suitable. Thus, of the mineral astringents, nitrate of silver, sulphate of zinc, and the preparations of iron; and of the vegetable, catechu, kino, pomegranate bark, bael fruit, hæmatoxylon, and guaiacum have been given with benefit. The mineral astringents are not adapted to cases where inflammation is still going on. In some instances, nux vomica or strychnia, aconite, turpentine and copaiba are said to have been useful.

When tonics are indicated, there is none better than quinine, and when, from any periodicity in the symptoms, the influence of malaria is suspected, it should be given in anti-periodic doses. It will often be observed in the progress of the case, that the evacuations become scanty and pale looking, and the abdomen full and uneasy. Astringents should then be omitted, and small doses of mercury with chalk given, and followed by a mild aperient. Whenever there is circumscribed tenderness and fulness, small blisters are often useful. Great care will be requisite in regulating the diet—the principle is, to administer as much nourishment as possible without increasing the purging. In

India, where the diet of the various castes is very different, special attention must be given to this point. In the higher classes of the Hindoos, some ingenuity is required to fix upon a diet which is nutritious, without being too bulky: milk mixed with half its quantity of lime water, sago, and arrowroot will be readily taken, but they are barely sufficient. Wine, and even spirits well diluted, may sometimes be given with advantage.

Local remedies.—The necessity for the use of fomentations, the turpentine stupes, occasional and repeated application of leeches and blisters, has already been stated. The blisters should be of small size, and limited to cases where there is circumscribed tenderness, and when the acute symptoms have been subdued. A large blister to the whole abdomen, as sometimes recommended, is objectionable. When the rectum is chiefly affected, benefit is often derived from a hip bath, or the application of leeches to the perineum or verge of the anus. An opiate lotion (grs. xx. ad. ℥i) applied to the same situations also gives much relief.

There are certain symptoms of dysentery for which special treatment is required.

Tenesmus.—An opiate injection, a suppository, leeches 'round the anus, a hip bath or fomentations to the perineum, a strong solution of opium (grs. xx. ad. ℥i) kept applied by a piece of cotton to the anus. Chloroform, in doses of twenty minims, has been used with good effect in relieving tenesmus and spasm of the muscular coat of the intestines.* Dr. Morehead suggests that the vapour of chloroform might be introduced into the rectum.†

Strangury.—Leeches to the perineum and lower part of the abdomen, fomentations, the hip bath, anodyne enemata, and suppositories.

Hæmorrhage.—Acetate of lead combined with opium, the kino powder, hæmatoxylon, tannic and gallic acid, &c.

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* Dr. Lownds. Transactions of Medical and Physical Society of Bombay. New Series, No. III., Appendix, page iii. Dr. Stovell, Opus Cit. page 32.

† Clinical Researches, page 304, note.

Treatment of dysentery by large doses of ipecacuanha.—Ipecacuanha has long been used in the treatment of dysentery. Within the last two or three years, it has been given in doses of from thirty to sixty grains, and in some cases to appearance with much benefit. To prevent vomiting, thirty minims of the tincture of the muriate of morphia are taken an hour or two before the ipecacuanha, and a sinapism is applied to the abdomen. After one or two doses, the patient often passes a copious feculent evacuation, with much relief of the dysenteric symptoms. My experience of this mode of treating dysentery is but limited. In the few cases in which I have tried it, the medicine was vomited within a quarter of an hour after it was taken. The cases in which this method of treating dysentery is likely to be useful, do not appear to be sufficiently defined. It cannot, I think, be applicable to severe asthenic dysentery where the evacuations are copious; but in sthenic dysentery in the early stage, the stools being almost entirely mucous and blood, it may perhaps be practised with advantage.*

Treatment of dysentery with the large warm-water enemata.—It has been recommended to use large warm-water enemata in the treatment of dysentery, under the impression that the removal of the secretions from the mucous surface is of great importance. An elastic tube is to be introduced into the rectum as high as the sigmoid flexure, and many pints of water injected.† This practice has not met with the approval of the profession.

Chronic Dysentery.

In acute dysentery, inflammation of the mucous membrane often ends in thickening, ulceration, and sometimes in gangrene. A process of repair may at once commence. During its progress there will be more or less purging, and the evacuations may contain blood, or secretions from the ulcerated surfaces. It is usual to consider cases of this kind as chronic dysentery; but this is scarcely correct. We might, with as much reason, call the consolidation of the lung, in which acute pneumonia often ends, "chronic pneumonia." Further, when disorganization has occurred, the destruction of texture may have been so great, that although inflammation has ceased, repair is not possible, and the patient slowly sinks from exhaustion. This also is not strictly speaking chronic dysentery, any more than an abscess in the liver after acute hepatitis is not chronic hepatitis.

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* Lancet, July 31st, August 14th, 1858. Indian Annals. Medical Gazette. Madras Quarterly Journal.

† Indian Annals.

Acute dysentery *may* certainly end in chronic dysentery—that is, the acute inflammation in some degree subsides, but a certain amount continues, and ultimately produces disorganization. But more frequently chronic dysentery, like other chronic diseases, arises independently of an acute attack.

Symptoms.—It sets in slowly and insidiously. There is at first a little looseness, the bowels being moved two or three times in the 24 hours—generally in the early part of the day. After a time the stools become more frequent, are passed with griping, and are found to contain mucous, or blood, or both. The patient begins to lose flesh, the tongue becomes florid and often glazed, and the abdomen tympanitic or tumid. The appetite is capricious, and the food imperfectly digested—as shown by flatulent distension and uneasiness after eating. The pulse is not at first much affected, but it is somewhat accelerated towards evening, and the hands are then hot, and the face flushed. As the disease advances, the abdomen becomes tender, and sometimes distinct induration may be felt, from matting of the omentum, or lymph deposits into the sub-mucous tissue. The evacuations assume various characters, being sometimes scanty, and containing much mucous and blood, at others copious and feculent, and with but little of either. They are often of a pale colour and frothy, and are sometimes streaked or speckled with blood.

The emaciation progressively increases, and is often out of proportion to the frequency of the stools; the hectic is more marked, and the patient gradually sinks from exhaustion—many months it may be after the attack commenced.

Pathology and causes.—The mucous membrane may be thickened, and granular lymph deposited on the surface. More frequently however ulcers, usually circular, are present. In many cases the morbid appearances are not confined to the large intestines; ulcers and granular lymph deposits being found in the ileum. These cases might perhaps be more correctly called chronic muco-enteritis.

Chronic dysentery is closely related to the cachexia which long residence in a tropical climate induces, whether this is due to heat alone, to malaria, or to the combined action of both. It seems to be also associated with certain diathetic conditions, as the scorbutic, &c. The most noticeable feature in the pathology of chronic dysentery, is the gradual but progressive course of the disease towards an unfavourable termination.

Diagnosis.—Chronic dysentery must be distinguished from diarrhœa. The nature of the evacuations, the condition of the abdomen, and the state of the circulation, will usually be sufficient. From chronic muco-enteritis it cannot always be distinguished.

Prognosis.—The prognosis is very unfavourable, unless the disease should be arrested in the early stage.

Treatment.—The treatment is in general unsatisfactory. The indications are to diminish local determinations of blood, to restrain the frequency and copiousness of the alvine discharges, and promote and maintain the nutritive function, and to remove any existing diathesis.

Leeches may be applied to any part of the abdomen where there is circumscribed tenderness, and afterwards small blisters. The diet must be carefully regulated, but it should be nutritious; and solid food should not be withheld, as it sometimes agrees better than liquid food. When the stools are frequent and copious, astringents in combination with opium should be given—at first gallic or tannic acid, bismuth, and the compound powder of ipecacuanha may be tried. These failing, acetate of lead or sulphate of copper, or nitrate of silver, should be substituted. In the scorbutic diathesis, the bael fruit (*ægle marmelos*) is often useful. Should the evacuations become scanty whilst astringents are being taken, they should of course be omitted; and if the abdomen should be swollen and tense, and the tongue dry, small doses of ipecacuanha and gentian are to be given, or a mild aperient, as castor oil.

A very important part of the treatment is to improve the general health: tonics, both vegetable and mineral, are indicated, but the *kind* of tonic which is best suited, can only be ascertained by experience. Some persons are most benefited by vegetable, others by mineral tonics. The various preparations of iron are often useful. The mineral acids, in combination with the infusions of quassia, gentian, and chiretta, sometimes give tone to the stomach and aid in the digestion of the food, besides neutralising any alkali that may be in excess. Of remedies occasionally useful may be mentioned oil of turpentine; this is strongly recommended by Dr. Wood.*

When the lower part of the large intestine is chiefly affected, relief is often experienced from injections, containing acetate of lead or sulphate of zinc.

It need scarcely be added, that great attention to clothing is of the utmost importance.

Change of climate in dysentery.—In acute dysentery, before disorganization has occurred, any change which involves a journey is out of the question; but should the attack have happened in a place where malaria abounds, the patient must if possible be removed to a short distance, so as to be beyond its influence. After disorganization, and in chronic dysentery there can be no question as to the propriety of a change from inland to the sea, coast, if it can be effected without much fatigue or suffering. But a long journey over bad roads should not be undertaken. A sea voyage in a comfortable ship is often serviceable, and removal from the tropics for those who are natives of a temperate climate is indispensable.

DIARRHŒA.—*More or less frequent alvine discharges, depending upon determination of blood to, or congestion of blood in, the mucous membrane of the intestinal canal.*—Diarrhœa is distinguished from muco-enteritis and dysentery, in being unconnected with inflammation. The derangement to which it is due may pass into inflammation, but then the disease is no longer diarrhœa. The essential symptom is purging, the evacuations having various appearances, according to the degree to which the glandular structures in connection with the intestinal canal are deranged. Fever is absent, and although there may be much griping, there is no tenesmus. There is often so much difference in the symptoms, that several varieties of diarrhœa may be distinguished.

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* Practice of Medicine, Vol. I., page 608.

Feculent diarrhœa.—The most simple and common form of diarrhœa is that which is called feculent. It is caused by indigestible food or exposure to cold, and is very common in weakly or delicate persons. The evacuations are copious and feculent, without mucous or blood, and indeed without any material change from their usual appearance beyond being liquid. They are often passed with griping. This form of diarrhœa is common in children, and can generally be traced to the milk being unsuitable. Feculent diarrhœa, though generally dependent upon the state of the mucous lining of the intestines, is sometimes due simply to increased peristaltic action produced by nervous influence. This is mostly observed in females.

The treatment of feculent diarrhœa consists in administering a laxative—should there be reason to suppose that irritating matters are retained in any part of the intestinal canal—and afterwards a mild opiate. It need scarcely be added, that the diet must be carefully regulated. Should the purging still continue, an astringent may be added, as chalk or gallic acid. In weakly persons, or where the attack is not connected with errors in diet, the treatment may at once be commenced with an opiate and astringent. This simple form of diarrhœa should not be neglected, as it is sometimes the precursor of attacks of cholera and dysentery.

Bilious diarrhœa.—Bilious diarrhœa is characterised by evacuations of a bright yellow or green colour, which seems to be caused by an excess of bile. They are passed with much burning pain at the lower part of the rectum. The attack often sets in with vomiting as well as purging, and sometimes there is collapse—the face being pinched, and the eyes sunken, the skin cold and clammy, and the pulse barely perceptible, or altogether absent. Sometimes cramps of the muscles of the limbs are severe. These symptoms are not unlike those of cholera, and on this account the diarrhœa now under consideration is sometimes named "bilious cholera." It differs from true cholera in this—there is no suppression of the secretion of urine, the bile is in excess rather than deficient, and the tendency is towards recovery, the disease being very rarely fatal. Bilious diarrhœa is not uncommon in the autumnal seasons in temperate climates, and in persons who have newly arrived in a tropical country ; but amongst the old residents and natives it is very rare.

The treatment should be commenced with an opiate, with which, in sthenic robust persons, five or ten grains of calomel may be combined. The patient should drink freely of demulcents, as barley or gum water. Should the purging continue, mercurial alteratives and astringents will be required.

Serous diarrhœa.—Children are sometimes attacked with diarrhœa, in which the stools are copious and watery. A similar kind of diarrhœa is not uncommon in adults in seasons when cholera is prevalent. This is serous diarrhœa. Its most notable feature is that it may be accompanied by collapse, terminating in death. Children sometimes die in a few hours. The treatment must be prompt. Astringents and opiates should be freely given, and stimulants—as ammonia—when collapse occurs.

In tropical countries, asthenic or cachectic persons, and especially children, are liable to suffer from purging of pale, watery, sometimes chalky or yeasty evacuations. These attacks appear to be often excited by cold, and are said to be common in the cold and wet seasons at hill sanitaria in India. This form of diarrhœa is often thought to be connected with deficient secretion of bile, but this is doubtful. The treatment consists in attention to clothing and diet, the use of tonics, mild astringents, and alteratives.

Chronic diarrhœa.—Diarrhœa, which is continuous for any considerable time, usually ends in inflammation, and therefore merges into muco-enteritis or dysentery. But when persons are delicate, and especially in tropical countries, attacks of diarrhœa, lasting for a few days, are very common. They are often immediately excited by some error of diet or alternation of temperature. The tendency to these attacks may sometimes be obviated by attention to clothing, regulation of the diet, and by improving the general health. Not unfrequently the evacuations are of a pale colour. In such cases, a few grains of blue pill with ipecacuanha and taraxacum at bed-time, and the nitro-muriatic acid during the day, are very serviceable.*

Diarrhœa in children.—Diarrhœa in children is of common occurrence, and often connected with teething. The *serous* form is very dangerous, sometimes causing death in a few hours. The most simple forms, if neglected, are apt to pass into muco-enteritis.

Anæmic children in India suffer, especially in the rainy season, from diarrhœa, in which the stools are of a pale colour, often consistent, and passed without griping. The error is sometimes committed of attributing the purging to hepatic derangement. It is more probably related to anæmia as the predisposing, and to cold as the exciting cause. Attention to clothing and tonic medicines are the chief means of cure. Mercury should not be given.

The treatment of diarrhœa in children is to be conducted upon the same principles as in adults. It must be remembered, however, that during the first two years of life, opium should be administered with much caution.

Hill diarrhœa.—At some of the hill sanitaria of India, persons are attacked with purging, which seems to be often due to chronic muco-enteritis. The disease has been called "hill diarrhœa." The cause is not apparent: some have thought that it is the effect of a cold damp climate upon persons who had been previously rendered predisposed by the hot weather of the plains.† Others believe that something more is required, and that it is to be found in "malaria."‡

Whether the change to a cold damp climate is sufficient to produce in persons "in the prime of life and of sound constitution" the disease in question, may perhaps be doubted; but there is not, on the other hand, proof that malaria is the missing factor.

The symptoms in some instances were those of diarrhœa, but more frequently were characteristic of chronic dysentery or muco-enteritis. Treatment by astringents and tonics in the early stage is said to be often successful; but if the disease is allowed to make head, no remedy is of more than temporary benefit.

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* I have devoted much less space to chronic diarrhœa than most other writers on diseases of tropical countries; as, I believe, it is more correct to refer attacks of long continued purging to chronic dysentery or muco-enteritis.

† Morehead's Clinical Researches, pages 279 and 280.

‡ Indian Annals, No. I., pages 311—517.

Attempts have been made to show that this form of disease is peculiar to certain altitudes, and that there is an elevation below which it does not occur. Should this be the case, the fact is doubtless to be explained by the difference of temperature.

INFLAMMATION OF THE CŒCUM.

Inflammation is sometimes, though rarely, limited to the mucous membrane of the cœcum, and caused by irritating matters in the gut—as hardened fæces, indigestible food, intestinal concretions, &c.

The symtoms are pain and fulness in the right iliac region, with constipated bowels. The treatment requires the application of leeches, and the use of oleaginous purgatives and enemata.

The inflammation may extend from the mucous to the other coats, and even to the parts external to the peritoneal covering. In addition to the symptoms just noticed, there is a distinct circumscribed tumor. Should the disease not be relieved, abscesses form in the lumbar region, which may open externally or burst into the peritoneal sac.

When there is evidence of abscess forming, fomentations and poultices should be used, in addition to the remedies just stated; and when fluctuation is distinct, the abscess should be opened.

INTESTINAL CONCRETIONS.

Hard substances of various sizes are sometimes found in the intestinal canal. Occasionally they are so large as to obstruct the passage of the contents, and to cause ileus. They appear to be formed of the intestinal secretions and indigestible substances which have accumulated around a sort of nucleus, as the husks of seeds, or the seeds or stones of fruits, biliary calculi, or the like. Sometimes they consist of carbonate of magnesia or lime which has been used as a medicine. They may be passed by stool or vomited, or increasing in size, may be a cause of intestinal obstruction. They are said to cause circumscribed colicky pains.

CONSTIPATION OF THE BOWELS.

The evacuations from the bowels may be less frequent or less in quantity than is natural to the individual. The bowels are then said to be constipated. No fixed rule can be laid down as to what amount of unfrequency should be considered as constipation, there being much difference in different persons in regard to the periods at which the bowels are relieved. Most persons, it is true, have one evacuation in the twenty-four hours, but others have more than one, and some may habitually have one only in several days. In deciding upon the existence of constipation, it is therefore necessary to ascertain the habit of the patient when in health, as regards the frequency with which his bowels were moved. When there is constipation, distension, uneasiness, and sometimes colicky pains are complained of. There may be also headache, low spirits, and uncomfortable feelings after food has been taken. Unless some such symptoms are present, interference is scarcely necessary, although the bowels may be confined. But it must be remembered, that such symptoms may occur, notwithstanding that there is a daily evacuation from the bowels, should it be too small in quantity.

When constipation is habitual, it often leads to hæmorrhoids and bleeding from the rectum, and in females to derangement of the uterine function. It is also said—but not without exaggeration—to be productive of many secondary derangements. Some, indeed, of the supposed effects of constipation are more probably the causes of it.

Constipation may arise from (1) irritability of the muscular coat of the intestines being impaired; (2) the stimulus being insufficient; (3) a want of readiness in the muscular fibre to contract.

Impaired irritability is generally noticed in asthenic persons, and is due to imperfect nutrition. The stimulus is in some degree wanting when a diet is taken which is not sufficiently bulky and too readily assimilable, or when the secretion of the liver or of the glands of the intestines is deficient. A want of readiness in the muscular coat to contract is sometimes the result of over-distension, but more frequently is due to a change in the time at which the bowels are usually relieved, whereby the habit of the contraction is, so to speak, broken.

Amongst the more obvious causes of constipation, are sedentary habits, inattention to the calls of nature, close mental occupation, certain kinds of food, &c.

Treatment.—An occasional attack of constipation, when so severe as to cause inconvenience, must be treated by aperients.* Habitual constipation is, if possible, to be remedied by the removal of the cause : asthenic states are to be got rid of by a tonic regimen and tonic medicines; the stimulus may be rendered more efficient by making fruits of various kinds a part of the ordinary diet, and by using bread made of flour from which the bran (husks of the corn) has not been altogether separated. When the secretion of bile is clearly deficient, mercurials may be given, but with much caution. Should these measures fail, more decided stimulus must be afforded in the use of aperient medicines or enemata. The aperients usually selected are those which act upon the lower part of the intestines, as aloes, and they may be combined with rhubarb or soda; sometimes the more drastic purgatives in small doses are useful, as colocynth or even croton oil.

The contractility of the muscular fibre may often be restored by rigidly observing a fixed hour for the evacuation of the bowels by devoting sufficient time to this object, and by making pressure in the course of the colon. Plenty of active exercise, as riding and walking, also conduces to the same result.

INTESTINAL WORMS.

The entozoa which are found in the intestinal canal have been described (page 81).

Symptoms.—Intestinal worms may exist without symptoms, but very generally they cause more or less pain and uneasiness—at times of a griping kind, but more frequently of a gnawing or biting character. There is often itching at the anus and nostrils, and this is particularly the case in children, who, when suffering from worms, constantly scratch those parts. The bowels are liable to be deranged : sometimes there are symptoms resembling dysentery—mucous and blood being passed with tenesmus—at other times the bowels are constipated. Digestion is imperfectly effected, the abdomen is often swollen, the breath fetid, and the tongue coated or florid. A state of general derangement is not uncommon, viz. emaciation, pale and sallow skin, dark discolouration under the eyes, &c. In some instances the general disturbance is a low form of fever, which has sometimes been called " worm fever."

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* For the treatment of constipation from obstruction, the student is referred to colic and ileus (page 201).

Many secondary or sympathetic derangements are believed to be caused by intestinal worms. Convulsions in children, and epilepsy and chorea, when they occur before puberty, are without doubt often produced by them. Many other derangements have likewise been attributed to them, chiefly because they have disappeared on the removal of the worms. From amongst these may be mentioned palpitation of the heart, headache, sleeplessness, muscular twitchings, defective sight, attacks of hysteria, menorrhagia, &c. But there is difficulty in determining how far such derangements are merely coincidental; and there is no question, that intestinal worms have been accused of doing more harm than they have done or are capable of doing. On the other hand, seeing that worms are sometimes found after death in persons who had not during life been aware of any inconvenience from their presence, the opinion has been entertained that they are harmless. The truth seems to lie between these extremes. They are often quite harmless, but sometimes—perhaps, from unusual movement or some other cause—they give rise to some of the symptoms which have been noticed.

There is no reason to suppose that worms have the power of injuring, still less of perforating, the coats of the intestines. They have, it is true, been found in the sac of the peritoneum, but always when there was an opening otherwise produced through which they might have passed.

Treatment.—The indication of treatment is to expel the worms, and afterwards to remove any derangement that may be present. As regards the expulsion of the worms, there is some difference in the measures to be adopted according to the kind of worm.

The ascaris lumbricoides or round-worm, may be often got rid of by active purgatives—as calomel, jalap, scammony &c., and rhubarb. Tonics are often combined with the purgatives. Of of late, a remedy which has anthelmintic properties distinct from its purgative action, has been much employed, viz. santonine.*

The *ascaris vermicularis,* or thread worm, may sometimes be destroyed by injections into the rectum. The injections usually employed are bitter infusions, solution of common salt or of nitrate of silver, vinegar and water, &c; but many other solutions have been recommended. Whilst the enemata are being used, the bowels should be kept free by active purgatives—as jalap, scammony, &c.

For the treatment of the *tænia or tape-worm,* various remedies have been employed. Those now used are turpentine, koussoo, male fern, kameela, and pomegranate. Turpentine is one of the oldest of the vermifuges. It may be given in doses of from half an ounce to an ounce, combined with an equal quantity of castor oil; and is sometimes very successful. The koussoo is given in the form of infusion: half an ounce of the dried leaves are steeped in half a pint of luke-warm water for a quarter of an hour, and the whole swallowed. The male fern is usually administered as an ethereal tincture in doses of one to two drachms. It is, perhaps, of all the anthelmintics the most efficacious. The kameela has scarcely maintained its reputation. It may be given in powder, in doses of from two to four drachms, or as an ethereal tincture in doses of two to four drachms. The tincture is made by macerating for two days six ounces of the powder in one pint of rectified spirit. The bark of the pomegranate root has sometimes been very successful. Two ounces should be placed in one and a half pint of water, which should be boiled down to three-fourths of a pint, and two ounces given for a dose, and repeated every half hour for three doses.

After anthelmintics have been given, it is advisable to administer some aperient medicine.

HÆMORRHOIDS.—*Piles.*—By hæmorrhoids or piles is understood a discharge of blood from the lower part of the rectum, or the formation of small tumors, either within or external to the sphincter.

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* Santonine is a crystalline principle, obtained from *artemisia santonica.* It may be given in doses of from three to six grains in sugar.

The bleeding may be due to simple congestion of the mucous membrane, or associated with the small tumors just noticed. When unconnected with hæmorrhoidal swellings, it is generally caused by obstruction to the local circulation—as from hardened fæces in the rectum, or by some impediment to the passage of blood through the liver. In other instances the bleeding is due to a relaxed or atonic state of the membrane. Sometimes a small vascular point can be detected, from which the blood issue in jets.

Hæmorrhoidal tumors or piles.—The hæmorrhoidal swellings or piles sometimes consist of distended and thickened hæmorrhoidal veins, covered with mucous membrane or skin; or some of the veins having been ruptured, they are formed of coagulated blood in a cyst, which may have become thickened by successive attacks of inflammation. In some cases of long standing, the tumors have a fibro-cellular, and when external to the sphincter even a warty appearance. Associated with the hæmorrhoidal swellings, there is often a thickened and congested state of the mucous membrane.

Symptoms.—The symptoms of hæmorrhoids are pain and fulness, with throbbing in the perineum and around the anus. In plethoric persons there may be febrile disturbance. There is much pain in defœcation, and sometimes sympathetic derangement of the uterus or bladder. These continuing for a few hours to a few days, there is a discharge of blood, and the symptoms are relieved. When the tumors are of long standing, they are liable to become inflamed, and are then very painful; sometimes they are excoriated and fissured, being the source of much suffering. In many instances they lead to prolapsus of the rectum. After the piles have been congested or inflamed, they shrink and become almost insensible for a time, but the congestion or inflammation is nealy certain to return.

The periodical discharge of blood, which is common in piles, is often productive of relief, by removing congestions of various organs, especially of the brain. Its non-recurrence or sudden arrest has been followed by serious derangement.

Causes.—The predisposing causes of piles are general plethora, torpidity of the liver, sedentary habits, and everything which interferes with the circulation through the portal vessels.

The exciting causes are constipated bowels, drastic purgatives, and anything which causes determination of blood to the lower part of the rectum.

Treatment.—The main indications are—1. To remove the cause. 2. To palliate the local symptoms. 3. To get rid of the swellings.

Plethora must be removed by a restricted diet and aperients, and sometimes by the abstraction of blood. A costive state of the bowels should be relieved by mild laxatives, as confection of senna, sulphur, &c. If the secretion from the liver is not free, small doses of blue pill, ipecacuanha, and taraxacum may be given. Much relief is often experienced from injecting a pint of cold water into the rectum after the bowels have been moved

When the piles are inflamed, the inflammation must be treated upon the usual principles: the patient should be kept at rest, and fomentations and opiate lotions used. When the piles are external, the compound gall ointment is useful. In chronic cases, more decided astringents, as infusions of catechu or kino are sometimes preferable. Should the piles protrude, they must be returned within the sphincter. In cases of long standing, there is sometimes mucous or muco-purulent discharge from the rectum; injections of sulphate of zinc or acetate of lead are then useful.

When all other measures have failed, the question of removal by a surgical operation will have to be considered. For information on this subject, the student is referred to works on surgery.

Tabes mesenterica.—Tabes mesenterica is the deposit of tubercle in the mesenteric glands, and is often associated with similar deposits elsewhere. It may occur at all ages, but is most common in childhood.

Symptoms.—The symptoms are obscure and often marked by derangements, which are the result of tubercular deposit in other situations. Those which seem to be the most characteristic, are symptoms of chronic peritonitis, with marked swelling of the abdomen, and progressively increasing emaciation. The enlarged glands can sometimes be felt as knotty swellings. The appetite is in general deranged, and not rarely inordinate; the bowels are often loose, and the evacuations pale and chalk-like. In many cases hectic fever sets in, the patient becomes more and more emaciated, and sinks from exhaustion. In other instances, after the disease has continued for many months or years, slow recovery takes place.

Pathology and causes.—Tabes mesenterica is essentially connected with the strumous diathesis, and is said, but without much reason, to be sometimes excited by irritation of the intestinal canal, and the sudden disappearance of cutaneous diseases. The exciting causes are unknown. It essentially consists in the deposit of tubercle in the glands. This may remain for a longer or shorter time in its crude state without change, but it at length softens.

Treatment.—The treatment is that which is proper for the removal of the scrofulous diathesis (p. 70). Attention should be paid to the state of the bowels, and frictions and slight counter-irritation used to the abdomen.

CHAPTER IV.

DISEASES OF THE LIVER.

Situation of the liver.—The liver occupies the right hypochondriac, epigastric, and a portion of the left hypochondriac regions. Its position and limits may be ascertained by percussion, and the relation of its borders and surfaces to certain external points determined; allowance must, however, be made for the effect of forcible inspiration and expiration, and of altered states of the organs in its neighbourhood. In the recumbent posture, the lower or anterior border does not project below the margin of the chest, but by relaxing the abdominal muscles, and gently pressing the fingers underneath the cartilages of the eighth and ninth ribs, it may be distinctly felt. Upon the patients taking a deep inspiration, the descent of the organ against the finger will be very apparent. On tracing this border towards the ensiform cartilage, the notch between the right and left lobes will be felt. Beyond this point, the left lobe is immediately behind the abdominal wall for about two fingers' breadth below, and to the right of the point of the ensiform cartilage. Tracing the border backwards, the finger will reach the fundus of the gall bladder, opposite the cartilage of the tenth rib. The extent of the liver upwards may be ascertained by percussion. On the right side, from the margin of the chest to the upper border of the sixth rib, the sound during ordinary breathing is completely dull on the slightest percussion—no lung being here interposed between the wall of the chest and the liver. Above this point, and as high as the fourth intercostal space, the sound is resonant on gentle, but dull or firm percussion—the liver being here overlapped by the lung. Above the fourth intercostal space, the most convex portion of the organ does not reach, so that resonance is there complete both on gentle and firm percussion. In the middle of the chest, dulness extends from two fingers' breadth below the ensiform cartilage for about three inches upwards. On the left side for about two inches above the margin of the ribs; but the upper limit cannot be clearly made out, as the hepatic blends with the cardiac dulness. The extension of the left lobe towards the left side is about one and a half inches beyond the middle line.

In the right lateral region, the liver is over-lapped by the lung from the fourth to the eighth ribs—between these points, there will only be dulness on firm percussion—below the eighth rib there is no lung, and consequently the dulness is complete on gentle percussion. Posteriorly the lung lies over the liver as low down as the eleventh rib, and consequently on gentle percussion nearly the whole of the dorsal region will be resonant. On firm percussion dulness will be elicited. The limits of the dulness, as just described, were noted during ordinary respiration. During forcible inspiration or expiration, they will be increased and diminished.

HEPATITIS.—*Inflammation of the substance of the liver, or of its peritoneal investment, or of both.*

Amongst the serious diseases of tropical regions, inflammation of the liver has always occupied a prominent place. The deaths from hepatitis, in the Military and Civil Hospitals of the Bombay Presidency in the year 1861, amounted to 90, of which rather more than one-half were in natives.

During the same period 23 native patients died from this disease in the Jamsetjee Jejeebhoy Hospital. It is thus evident, that persons born and resident from their birth in India, are by no means exempt from the fatal forms of hepatic disease.

ACUTE HEPATITIS.—Acute hepatitis is more common in tropical than in temperate countries, prevails more amongst the foreign residents than in the indigenous population, and is said to be more frequently met with in the eastern than the western tropical hemispheres.

Symptoms.—The prominent or characteristic symptoms are fever—varying much in severity—pain in the right hypochondriac or epigastric regions, increased by pressure and a deep inspiration, and sometimes shooting to the shoulders—a pinched and anxious face, hurried breathing, cough, nausea, and vomiting. Hepatitis usually sets in with chills or rigors, which are followed by heat of skin, and pain and tenderness in some part of the hepatic region. The pain may extend over the lower part of the right side of the chest, and upper part of the abdomen, or be limited to the margin of the ribs, or the epigastrium close to the ensiform cartilage. When the convex surface is inflamed, it is felt between the sixth and seventh ribs. Sometimes it shoots to the shoulders, the right or left, according to the lobe affected. The absence of pain in the shoulder is a negative symptom of little importance in diagnosis, but its presence is significant as confirmatory of other symptoms. The pain is sharp and lancinating in inflammation of the surface; dull and aching, or altogether absent, in inflammation of the deeper portions of the organ. As it is increased by the descent of the diaphragm, the movements of the right side of the chest are restricted, and the breathing is hurried and shallow. Should, however, the inflammation be deep in the substance of the liver, the respiration is unaffected. A frequent, short, dry cough is common when the right, nausea or vomiting when the left lobe, is inflamed. The cause of the cough is not always apparent: it is attributed to pressure on the lung, to sympathetic irritation, to the pulling down of the diaphragm, and to intercurrent bronchitis. The decubitus is generally on the back, inclining to the right side; on the left side it is often but not invariably painful, and now and then the patient prefers to lie on this side. In some cases, relief appears to be obtained in the sitting posture, the body being bent forwards, and the arms folded upon the chest. Much importance has been attached to tension of the right rectus muscle as a symptom of hepatitis, but this is observed in any abdominal muscle, which is situated over a tender organ, and is nothing more than an instinctive or a voluntary contraction to ward off pressure.

The liver is seldom inflamed throughout its whole extent, hence general bulging or enlargement of the hepatic region is rare before abscess has formed. Occasionally fulness of the lower part of the chest, or fulness and hardness beneath the margins of the ribs are present, and the limit of the hepatic dulness is higher than usual in the chest; but inflammation often exists without much swelling, and enlargement from congestion is often present without inflammation; it has indeed been stated, and the statement is well worthy of being remembered, that any considerable enlargement of the liver (hepatic abscess excepted), is more likely to be due to congestion than inflammation. Tenderness, though often present, is not always a very marked symptom; in some cases it can only be detected by placing the points of the fingers beneath the margins of the ribs, and making gentle pressure upwards, or, as recommended by Dr. Morehead, by placing the hand on the abdomen, and meeting the liver as it descends during inspiration. It might be supposed, that the alvine discharges and the skin (jaundice) would indicate suspension of the biliary secretion, but in general they do not. This has been explained by the hepatic or nutritive capillaries being alone implicated, the portal capillaries continuing their office of secretion undisturbed; but as the healthy nutrition of an organ is essential to the performance of its function, it is scarcely conceivable that bile is secreted in those parts of the liver which are inflamed. It seems more probable, that the absence of marked change in its secretion, is due to the limited extent of the inflammation. Although jaundice is not a constant nor indeed frequent symptom, it is every now and then present. Along with the local symptoms which have just been stated, there is febrile disturbance, but which varies much in degree, and may indeed be very slight when the inflammation is of small extent and situated deep in the substance of the organ. It is also less marked in asthenic than sthenic persons, and in the former is often remittent. The character of the fever is determined in part by the situation of the inflammation, and in part by the constitution of the patient. It is of the sympathetic inflammatory type when the surface of the organ is inflamed in sthenic persons; whilst in very asthenic persons, it often assumes an adynamic or typhoid character from the commencement. In most cases, the face is pinched and anxious, the appetite lost, and sleep disturbed. The mind is usually unaffected, delirium being rare before the formation of abscess. The state of the pulse, tongue, and bowels, has reference to the constitution of the patient. In sthenic persons the pulse is full and hard, as well as frequent; the tongue is coated, and the bowels are constipated. In asthenic persons there is in general a small and easily compressible pulse, a florid tongue—especially at the tip and edges—and a tendency to diarrhœa.

Progress and results.—In a person of good constitution, and who has been properly treated, the symptoms often disappear; or having been in a great measure subdued, there is a longer or shorter period, during which the limits of the hepatic dulness are somewhat increased, and convalescence is slow. Such cases cause much anxiety. In asthenic states, or when the imflammation has not been early treated, it passes into suppuration and the formation of abscess.

Hepatic abscess.—There is some variety in the symptoms which indicate the formation of abscess. 1*st.* After the symptoms of hepatitis have continued for several days, a rigor sometimes occurs, followed by subsidence of the acute pain, a modification of the febrile disturbance, and evidence of some degree of enlargement of the organ; more frequently the rigor is wanting, and consequently no importance is to be attached to this as indicating that abscess has not formed. The enlargement may show itself by fulness beneath the margins of the ribs, extension of the hepatic dulness upwards, or by both. Short dry cough is usually present, the breathing is thoracic and shallow, and the pulse becomes more frequent, and loses in strength. 2*nd.* It more frequently however happens, that the pain is relieved and the fever checked, but without convalescence. The patient sleeps and eats badly, becomes daily more emaciated, and complains of constant languor and weakness.

The face is pinched and anxious, and the pulse above the natural frequency. Sometimes he is harassed by flying pains of the lower part of the chest, or by fixed pain in one of the shoulders. The tongue is florid, and the bowels are often irregular. At length there are chills towards evening, followed by transient heat of skin and sweating. For a time there may be no swelling, but sooner or later the lower part of the chest begins to bulge, or there is swelling in the upper part of the abdomen beneath the ribs. Along with enlargement, it is not uncommon for acute pain to set in suddenly—a circumstance worthy to be remembered, lest it be mistaken for a symptom of acute primary hepatitis, and too active treatment adopted. The exact situation of the swelling depends of course upon the part of the organ in which the abscess has formed. If in the left lobe, it is in the epigastrium; if at the lower edge, in the upper part of the abdomen; and if in the upper part or substance of the right lobe, it can be ascertained by percussion, to reach upwards in the right side of the chest. In this latter situation, the swelling produces cough and dyspnœa. As the abscess enlarges, the patient becomes more and more emaciated; he suffers from weight and throbbing, and sometimes attacks of agonizing pain; the hectic accessions are more severe; digestion is very imperfectly carried on—food causing great distension of the stomach, which adds much to the patient's suffering—the sleep is little, and disturbed by constant startings, or the nights may be altogether sleepless. It is at this stage that dysenteric symptoms are often observed.

The symptoms above described, and the local swelling increasing "*pari passu*," the patient may sink from asthenia, the walls of the abscess remaining entire: this is usual when the abscess is large, or when there are several abscesses. In a considerable proportion of such cases, death is immediately caused by acute peritonitis. Every now and then, after there have been unequivocal signs of hepatic abscess, the swelling gradually disappears and the patient recovers his health without the abscess having burst. We must then believe that its contents have been absorbed. In a large proportion of cases, however, the pus makes its way towards some external outlet, and symptoms arise, varying according to the channel and the mode in which it is to be discharged.

There are three principal channels through which hepatic abscesses may open:—the lungs, the intestinal canal, and the external surface.

Through the lungs.—In the most favourable cases, adhesion takes place between the coverings of the abscess and a portion of the lung opposite to a bronchial tube of some size. A communication between the interior of the abscess and the tube is quickly effected, the pus passes through the aperture, and is coughed up, often in considerable quantity. Should the abscess be of small size, and the constitution of the patient good, recovery may be hoped for. Instances of such direct communication are rare. More frequently, as the pus makes its way towards the lung, inflammation and consolidation of the pulmonary tissue are produced. The symptoms and physical signs of pneumonia are set up, and the expectoration is muco-puriform, tinged red, and varying much in quantity. The exact manner in which in these cases the matter of the abscess reaches the bronchial tubes, has not been traced. The chance of recovery will depend upon, whether the abscess is single or not, its size, and the state of the patient's constitution. The muco-puriform brick-red sputum was at one time thought to be pathognomic of abscess of the liver opening into the lungs, but it is now known to be present in asthenic pneumonia, the liver being quite healthy. There is yet a third mode in which an abscess of the liver may communicate with the lung. The coverings of the abscess and the lungs may become adherent, the pulmonary tissue and intervening parts may soften down, and the abscess communicate with a large ragged cavity in the base of the lung. In such cases, cavernous sounds will be heard under the stethoscope, and cough and expectoration of sero-puriform or muco-puriform red or brown fluid, sometimes though rarely tinged with bile, will be almost constant.

Through the stomach and intestines.—There are no symptoms which indicate the probability of abscess of the liver opening into the stomach or intestines. When the diagnosis has been clearly made out, and evidence is wanting of the abscess making its way towards the chest or external surface, it may perhaps be inferred, that the stomach or intestinal canal is the channel of exit. We cannot however be sure of this, until pus is either vomited or discharged by stool.

External surface.—In a considerable proportion of cases, the abscess approaches the external surface. The swelling increasing in a direction outwards, may appear below the ribs, or at one of the intercostal spaces, or in the epigastrium. If of large size, the centre is but little if at all prominent, and death takes place before there is pointing. But if small, there is central prominence where fluctuation is felt; the skin becomes reddened, and at last giving way, the abscess is discharged externally. The following may be the further progress:—1*st*, the cavity may be obliterated and heal; 2*nd*, air may enter and cause decomposition of the pus, and inflammation of the walls of the abscess; or the gases resulting from such decomposition being absorbed, irritative fever may be set up; 3*rd*, the abscess may continue to discharge without any appearance of obliteration; 4*th*, the abscess having opened, the integuments around the opening may ulcerate or slough.

Of the channels of exit just stated, that through the lungs is the most frequent, and perhaps the most favourable. Of abscesses that make their way to the surface and open of their own accord, a fair proportion do well. The discharge of hepatic abscess into the stomach or intestines is, according to Dr. Morehead's experience—which is quite in accordance with my own—rare, and not so favourable as through either of the other channels.

Abscesses of the liver have also been known to open into the pericardium, vena cava, right kidney, hepatic duct, &c.

It must not be supposed that hepatic abscess is always preceded by symptoms of hepatitis. When situated deep in the substance of the liver, there may be no characteristic symptoms, until the peritoneal covering is reached. In most instances however, whilst the abscess is forming, the patient loses flesh, and has occasional slight hectic accessions; the tongue is florid, and the bowels often irregular. Should there be nothing to explain these symptoms—no intemperate habits, or malarious influence, or mental disquietude—we may infer that there is abscess deep in the substance of the liver. But cases occasionally occur where the abscess is not only deep in the substance of the liver but "encysted," in which condition it may remain for months or even years without giving any sign of its existence, unless we regard as such a feeble state of the general health. For my own part, I believe an encysted abscess of small size, deep in the substance of the liver, to be compatible with a state of perfect health, and I question if the slight derangements, which are sometimes present, are sufficiently characteristic to admit of anything like a trustworthy diagnosis being made.

Pathology of hepatitis.—The arrangement of the vessels in the liver may possibly modify to some extent the effect of inflammation upon the function of the organ. The capillaries involved in the inflammatory process, are doubtless the hepatic which are nutrient of the organ, and there is no reason to suppose that the portal capillaries participate. As the latter furnish the constituents of the biliary secretion, it is easy to conceive it possible, that the secretion of bile will not be suspended to the same extent as the secretion of organs which are supplied with only one set of vessels. This has been thought to explain in a great measure the little functional derangement which is present in hepatitis. With no wish to under-estimate the value of this explanation, I am inclined to attach more importance to the limited extent of the inflammation.

The effect of elevated temperature, in predisposing the liver to acute inflammation, which often terminates in abscess, can hardly be doubted; and attempts have been made to explain this upon chemical and other principles—it need hardly be said with little success. All, perhaps, that can be affirmed is, that long-continued residence in a hot climate produces a state of cachexia, in which the liver is prone to take on suppurative inflammation. At the same time it must be conceded, that there is some peculiarity in the cachexia which determines the inflammation to the liver instead of other organs. It is possible also, that temporary exposure to a high temperature may lead to hepatic inflammation, just as it is known to lead to cerebral inflammation.

The connection of hepatitis with dysentery is a very important point in its pathology. Formerly, hepatitis was considered a cause of dysentery,—the acrid bile of the inflamed liver was thought to be an irritant to the lining membrane of the intestines; but of late years the tendency has been towards an opposite view, viz., to regard hepatitis as caused by the absorption of pus or other secretion from ulcers of the intestinal mucous membrane. The direct vascular connection between the intestines and liver, by means of the portal system of vessels, leaves little doubt that hepatic abscess may be produced by local pyœmia; but experience in tropical countries has abundantly shown, that this is not the ordinary, nor indeed the most frequent mode of its production. Nevertheless it must be admitted, that dysentery and hepatitis are so often associated together, that their pathology must possess much that is common to both.

Sometimes the diseases set in together, running a parallel course, one or other at times predominating. But in the large majority of cases, when they become companions, it is in the advanced stages. Thus, after abscess of the liver has existed for several days, dysenteric symptoms are manifested, to which the fatal termination is often immediately due; or it may be that, after dysentery has been present for several days, abscess of the liver makes its appearance. It is this sequence of abscess upon dysentery which has given countenance to the pyœmic doctrine, but it is quite possible that the reduced and cachectic state which in hepatic abscess leads to dysentery, will, when caused by dysentery, as certainly lead to hepatic abscess; or in other words, the cachexia of dysentery is as logical an exponent of the occurrence of hepatic abscess, as the cachexia of hepatic disease is of dysentery. When acute inflammation occurs in the substance of the liver, it commences with patches of turgescence and softening of the texture, which may vary from the size of a pea to an orange, and be one or many. Lymph is soon effused. Under favourable circumstances—that is, in persons of good constitution, the inflammation having been subdued, and the effusion being still fluid and not large in quantity—it may be absorbed; or the fluid part being absorbed, the solid residue may be organized into delicate areolar tissue, which does not materially injure the structure of the organ; or the effusion having coagulated, may undergo a process of degeneration, by which it liquifies and is absorbed. According to Dr. Morehead, this is only likely to happen when the exudation is small in quantity, surrounded by tolerably normal structure, has not been circumscribed by an organized layer, and has not been so copious as materially to interfere with the vitality of the tissues amid which it has been exuded. But when the inflammation has continued for many days, the patient is asthenic, or suitable treatment has not been adopted, the central part of the effusion is converted into pus, and the tissue into which it has been effused softens down, and becomes mixed with it. This conversion may extend to the whole of the effusion, the walls of the abscess being formed by the hepatic structure, which has a ragged irregular appearance. More frequently the outermost part of the effusion becomes organized into a low form of fibrous tissue, and a cyst is formed. In small and recent abscesses however, and in persons who are very asthenic, no cyst is formed; whilst in old abscesses it is of a fibroid character, sometimes measuring one-half or even three-fourths of an inch in thickness. Fresh effusion and conversion of lymph leads to increase in the size of the abscess. The pus is of various colours, depending upon the admixture of blood, and perhaps also of bile,—being white or dark brown, red, yellow, or of an orange colour. Its consistence also varies, being sometimes thick, and containing solid portions of lymph and shreds of broken down tissue, at other times thin and serous or tenacious.

Abscesses of the liver vary much in size and number. The whole of the right lobe is sometimes occupied by a single abscess as large as a cocoanut, and containing many pints of pus; at other times the abscess may not be larger than a small walnut. Frequently there is but one abscess; not rarely there are two or three, and now and then five, six, or even a larger number. In one of Dr. Morehead's cases there were eight abscesses.

In whatever direction an abscess tends to open, its walls, as a general rule, contract adhesions with the parts through which the pus is to pass, and in this way effusion or extravasation is prevented. Thus, when it is making its way towards the external surface, adhesion takes place between the walls of the abscess and the abdomen and chest: they all become blended together, and an aperture is gradually made through them by softening or ulceration of tissue. Similar adhesions are effected between the liver and lung, or between it and the stomach and intestinal canal whenever the abscess is about to discharge its contents through those channels: sometimes, however, adhesion is not completed, and the abscess bursts into the peritoneal or pleural sacs.

Morbid appearances.—We have rarely an opportunity of examining the liver after death in the early stage of hepatitis, as the disease is not fatal in that stage; but when persons have died from some other disease, the investing membrane has been found thickened and reddened, and covered with flakes of lymph; the substance of the liver red and friable, and on section marked by granular-looking deposits—due no doubt to the effusion of lymph into the lobules. It is chiefly after abscess has formed, that the effects of inflammation have been noted. The abscess, as before mentioned, may be single, large or small, or there may be several abscesses of various sizes. The situation may be the surface immediately beneath the peritoneal investment, or deep in the substance of the organ. They are most common in the right lobe. The contents may be pus of various shades of colour and degrees of consistence: in many cases it is flocculent—the flocculence depending upon lymph or portions of liver substance which have not liquified.

The mode of formation of hepatic abscess has been carefully investigated by Dr. Morehead. He states, that in the middle of the patch of turgescence which indicates the commencement of the inflammation, a circumscribed spot of a fawn colour is seen; this is at first firm, but soon becomes soft at the centre, and at length breaking down, is converted into pus. Around this drop of pus, the part immediately adjacent is shreddy and flocculent, further outward of a fawn colour and firm, and bounded by reddened parenchyma, around which there is healthy structure. At a more advanced stage, the outward part of the lymph becomes organized in varying degrees into a sort of membranous investment.

It is not uncommon to find collections of pus between the peritoneum and diaphragm, or between the latter and the pleura. Appearances of local peritonitis are nearly always present; the lymph effused connects the liver to the surrounding parts, and particularly to those through or into which the abscess is to burst. Thus, it may be adherent to the stomach or intestines, the base of the lung, or the wall of the abdomen.

Causes.—Of the predisposing causes, elevated temperature and malaria are by far the most efficient. The exciting causes are cold, injury, the presence of gall stones, great heat from exposure to the rays of the sun, mental depression, &c. In one instance, Dr. Morehead found a lumbricus in the centre of a hepatic abscess, and he thinks it probable, from guinea worm having been found in the liver, that lumbricus is not the only entozoon which may cause hepatic abscess. Hepatic abscess is often secondary upon ulceration of the intestinal canal, and occasionally upon injuries, particularly of the head. It is very doubtful if habits of imtemperance are much concerned in the production of acute hepatitis. And there is probably no truth in the statement, that it is caused by the abuse of mercury.

Diagnosis.—Acute hepatitis must be distinguished from pleuritis, pleurodynia, and gastritis, and from hysterical and neuralgic pains in the female; and hepatic abscess must not be mistaken for empyema. Hepatitis may be known from pleuritis by the pain being less stabbing and lancinating, and less decidedly aggravated during respiration; by the decubitus generally being less painful on the diseased than on the sound side, and by the absence of friction sounds. In some cases, pressure with the fingers will detect tenderness in the free edge of the liver. It should be remembered, that in hepatic inflammation, some degree of fulness beneath the ribs, or increase in the limits of the hepatic dulness, is observable. After effusion to any extent has taken place in pleuritis, it may be recognised by the characteristic physical signs.

The pain of pleurodynia is increased by superficial pressure and by movement, and is not in general accompanied by fever or much appearance of anxiety or distress. When the left lobe is inflamed, the symptoms certainly resemble gastritis: the vomiting will however be less urgent, the tongue less florid, and the pulse less contracted, nor will there be the same marked expression of the countenance as in the latter disease—that is, the face will be less pinched, and the eyes not sunken. Careful examination of the epigastrium will usually detect circumscribed fulness or hardness in that situation; moreover, it must not be forgotten, that acute gastritis is a very rare disease, unless produced by irritant poisons. Much difficulty will sometimes be experienced in distinguishing between hepatic abscess and empyema; in both there may be dulness on percussion, absence of breath sounds, and enlargement of the right side of the chest.

Treatment.—During the first two or three days of the attack, should the patient be sthenic, general blood-letting is proper; but the extent to which it is to be carried, must be determined by the general condition of the patient, and its effect upon the pulse. At a later period, or in asthenic persons from the commencement, blood should be alone drawn locally by leeches, and in very asthenic persons—the skin being coldish, and the pulse very feeble—the abstraction of blood in any way is inadmissible. When from the coated state of the tongue, and the fulness of the abdomen, there is reason to believe that the secretions of the intestinal canal are suppressed or retained, ten or fifteen grains of calomel, combined with one grain of opium, and two grains of ipecacuanha should be given, and four hours afterwards a dose of jalap or castor oil—the state of the tongue and the abdomen will be the guide as to the propriety or otherwise of repeating the calomel and aperient. If the tongue continue coated and the abdomen full, this point may be decided in the affirmative; if on the other hand the tongue should become florid or glazed, the repetition of either the calomel or purgative would be improper. In less sthenic persons, blue pill may be substituted for the calomel, and to those who are very asthenic, no mercurial preparation ought to be given. From the commencement of the treatment, the patient should be confined to the recumbent posture, the diet restricted in a greater or less degree, according to his general condition, and the right side of the abdomen and chest frequently fomented with hot flannels. After the more acute symptoms have subsided, tenderness often remains, with evidence of enlargement of some part of the organ, from which it may be inferred that lymph is effused and coagulated. The great aim now is, to bring about the re-absorption or the organization of the exudation, and for this three things are necessary:—1*st*, that the inflammation should be checked; 2*nd*, that the capillary circulation should be restored to its normal condition; and 3*rd*, that the powers of the system generally should not be too much depressed. The first two of these conditions will be promoted by the application of leeches and blisters.

In very asthenic cases, however, leeches cannot be used, and caution must be observed in the employment of blisters —they are apt to depress too much, and to be followed by troublesome ulceration or even gangrene. We must in such cases trust to fomentations, sponging the side with nitro-muriatic acid lotion, and applying the warm-water compress. The question will now arise, as to whether any medicines should be given internally, with the view to bring about absorption of the exudation? It is a doctrine in therapeutics, which has not been disproved, that in persons of good constitution, mercury carried to the extent of slightly affecting the gums, has the power of diminishing effusion of plastic material from the blood, and favouring re-absorption after it has been effused (page 146). At the same time it is equally well known that, in asthenic persons, mercury does not promote absorption of exudations, but rather favours their conversion into pus; and when there is a tendency to muco-enteritis or dysentery, this is greatly increased by mercury. Hence the inference is plain, that we should only seek to induce the constitutional effects of this medicine in acute hepatitis, when the patient is of good constitution, has not been too much reduced by active treatment, and does not exhibit a tendency to muco-enteritis. Moreover, it should never be prescribed if there is the least reason for supposing that suppuration has taken place; and if symptoms of abscess should come on during the continuance of the medicine, it must be at once omitted.

When mercury is contra-indicated, diuretics and diaphoretics may be given, and some of those medicines which are believed to resemble mercury in their action—as hydrochlorate of ammonia, taraxacum, nitro-muriatic acid. Throughout the treatment, care must be taken that the strength of the patient be not too much reduced, and when necessary, nutritious food—as milk, broth, and even wine and other stimulants—should be given; but in all sthenic cases in the early stage, the regimen should be antiphlogistic. Lowering treatment should not however be persisted in for more than four or five days.

If, as often happens in asthenic cases, the attendant fever is of a remittent or intermittent type, quinine, in anti-periodic doses, must on no account be withheld. It should be given without reference to any other mode of treatment that may have been adopted. In many cases anodynes will be required to procure sleep.

Treatment of hepatic abscess.—In the treatment of hepatic abscess, the objects to be aimed at are, to bring about the absorption of the pus, and failing in this, to support the strength of the patient, until such time as the abscess can find an external outlet. So soon as the abscess has formed, lowering treatment is to be abandoned ; the strength should be supported by nutritious food, adapted to the condition of the digestive organs, and tonics and stimulants given, if they do not produce undue excitement of the pulse and febrile reaction. Pain must be relieved, and sleep procured by anodynes, and when suffering is great, they may be repeated once or more during the twenty-four hours. Upon the first formation of abscess, a blister is sometimes useful in favouring absorption, but it should not be applied when the pus is rapidly making its way towards the surface or some other channel of exit. Fomentations, and the water compress, or a large soft poultice, often give much temporary relief.

Opening the abscess.—The question of opening hepatic abscess has been much discussed. Whilst always believing the general adoption of the practice to be unadvisable, I at one time thought there were exceptional cases to which it was applicable ; more extended experience has convinced me, that in no case is any material advantage gained by it. The small abscesses, in which it would do no harm, open of themselves, whilst in those which do not reach the surface, an artificial opening increases the patient's sufferings and hastens his death.*

CHRONIC HEPATITIS.—Chronic hepatitis has been applied to designate various morbid conditions of the liver. It should be restricted to two, viz:—1, *chronic enlargement ;* 2, *chronic contraction.*

Chronic enlargement.—Chronic enlargement, not rare in any country, is common in the tropics, and especially in persons who have suffered from acute hepatitis, dysentery, and fever, or been long exposed to malaria. The symptoms are more or less emaciation, uneasiness after eating, and other dyspeptic derangements; a sallow skin, and a tendency to constipation of the bowels—the stools having a clay-coloured appearance. These symptoms are often followed by fulness of the abdomen from ascites.

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* I here speak of abscesses which are clearly apparent. Of the practice of pushing a long trocar into the liver in order to search for an abscess I have no experience.

At the commencement there may be uneasiness of the hepatic region and some febrile disturbance, and afterwards a feeling of weight and dragging; but local symptoms beyond the enlargements are not marked. The degree of enlargement, which is often great, can be ascertained by percussion. The ascites is said never to attain to the same extent as in the contracted liver to be presently described, and the prognosis is more favourable than in the latter disease.

Diagnosis and prognosis.—The enlargement must not be mistaken for that of hepatic abscess or simple congestion—the history and absence of fever will be sufficient to distinguish from the former, the nature and persistence of the enlargement, and the emaciation and marked general derangement, from the latter. The prognosis is not on the whole favourable, though recovery in the early stage may be occasionally looked for; in the more advanced stage, when the general health has greatly suffered, it is unfavourable.

Pathology.—As the result of pre-existing acute inflammation or long-continued determination and congestion of blood, lymph is effused into Glysson's capsule, and becoming organized, causes thickening of that structure. There are also cells gorged with fat and other biliary elements, and congestion both venous and biliary. Whether the effusions into Glysson's capsule afterwards contract and press upon the vessels of the liver, causing atrophy of the organ, is uncertain. It is believed that this does sometimes happen, but in many instances such contraction has not to appearance commenced up to the time of death, the liver being found firm and dense, smooth on the surface, and in place of being pale as in cirrhosis, red and congested. Fibrous tissue in considerable quantity is often present in the portal canals.

Causes.—Residence in a hot climate; the action of malaria; exposure to the sun; attacks of acute inflammation; abuse of alcoholic liquors.

Treatment.—The cause of the enlargement is in the first place to be sought for, and if possible removed. Thus, change to a temperate climate, or from a malarious to a healthy district, the enforcement of abstinence, from exposure to the sun, or the abuse of alcoholic liquors, may constitute the chief part of the treatment. As regards medical means, a moderate action of the bowels should be maintained, the general health improved by suitable tonics, and absorption promoted by alteratives and deobstruents,—the nitro-muriatic acid and taraxacum, the various preparations of iron, or iron in combination with iodine, the bichloride of mercury in small doses, are amongst the remedies usually employed. When the collection of fluid is large, the question of removing it by tapping will arise, and must be determined by the considerations already stated (page 173).

CHRONIC CONTRACTION. *Cirrhosis.*—It is not uncommon in death from ascites, to find the liver indurated, of small size and pale colour, and its surface marked by irregular elevations and depressions. On section, the vessels are seen to be surrounded by thickened and condensed fibrous tissue. This is "cirrhosis." It is possible that this may in some instances be the advanced stage of that which has been called "chronic enlargement;" but cirrhosis is met with when there have been no antecedent signs of enlargement.

Symptoms.—The symptoms of cirrhosis are obscure. At first there may be slight pain in, and increase of, the limits of the hepatic region, with tumefaction beneath the ribs, and more or less febrile disturbance; but if such symptoms have been present, they will for the most part have disappeared before medical advice is sought for. The symptoms usually noticed, are derangement of the digestion, a sallow or jaundiced skin, gradually increasing emaciation, vomiting or discharge of blood by stool, and at length ascites. The ascites is peculiar in not being associated with dropsical swellings elsewhere; or if they do appear, it is long after the ascites, and they are limited to the lower extremities and lower half of the body. As the abdomen enlarges, the veins upon its surface become filled to compensate for the obstruction within. The limits of the hepatic region are sometimes found on percussion to be contracted; but when the ascites is considerable, there is difficulty in ascertaining this, by reason of the displacement of the liver and other organs, on account of the upward pressure of the fluid. The course of cirrhosis is slow but progressive: the ascites and the anæmia steadily increase, and the patient dies from syncope or asthenia, if not carried off by œdema of the lungs or an intercurrent inflammation.

Diagnosis and prognosis.—The diagnosis for the most part rests upon negative signs, viz. the absence of any other cause for the dropsy, and the limitation of the effusion for the most part to the peritoneal sac. The enlargement of the superficial abdominal veins, and the marked general anæmia and sallow skin are positive symptoms of some value. It is said that the granular surface of the liver may sometimes be felt, upon the patient's taking a deep inspiration, and that a friction sound may be occasionally heard.

Prognosis.—The prognosis is altogether unfavourable; the morbid state of the liver cannot be removed, and all that can be hoped for, is to prolong life and alleviate suffering.

Pathology.—Cirrhosis is by most pathologists considered to be sub-acute inflammation of the prolongations from Glysson's capsule in the portal canals. The inflammatory exudation becomes organized into fibrous tissue, which contracting, the vessels of the liver are compressed. The flow of blood through the branches of the hepatic artery being thus impeded or obstructed, nutrition is impaired, and the lobules become atrophied, whilst the pressure on the portal vein causes congestion of the capillaries of the mucous membrane of the intestinal canal and peritoneum, and accounts for the hæmorrhage and ascites which are so common in this disease. In the early stage, before contraction has commenced, the lymph effusions may probably increase the bulk of the liver, but as persons do not die at this early period of the disease, this cannot be proved by post mortem examination. The usual appearances found after death are contraction and induration of the organ; the surface being irregular and nodulated. On section, the cut surface is marked by white streaks, with here and there little nodules imbedded in a fibrous capsule, often as large as a pea. The colour depends upon the quantity of retained bile, and may be a pale buff, a bright yellow, or olive green. In tropical countries it is not uncommon to find abcesses in cirrhôsed livers; but this is said to be very rare in temperate climates.

Causes.—The causes of cirrhosis are by no means well known; it often occurs in drunkards, and especially in those who take spirits undiluted with water (dram drinkers), but it is not unfrequently met with in persons who are altogether abstinent. Of this, there have been many well ascertained instances in the Jamsetjee Jejeebhoy Hospital at Bombay.

Treatment.—The treatment mainly consists in the removal of the ascites and improvement of the general health. Diuretics in various forms and combinations should be tried, and tonics and mercurial alteratives administered. The question of tapping should only be entertained, when the quantity of fluid is so great as to interfere with the performance of some important function.

Congestion of the liver.—From the large size of the hepatic vessels, and the relation of the liver to the function of digestion, the quantity of blood circulating through it may vary without the limits of health being passed. The quantity however may be so large, or the blood may have accumulated in the liver so rapidly, as to cause derangement of function. The organ is then said to be congested. The symptoms are weight and uneasiness, or even pain in the hepatic region, sallow skin, yellowness of the conjunctivæ, and sometimes jaundice and indescribable feelings of languor: drowsiness and depression of spirits are also common symptoms. Enlargement of the liver can be readily detected by percussion. Under appropriate treatment, and the removal of the cause, the circulation is restored to its natural state; but if the congestion should become permanent, it leads to destruction of the hepatic cells, and consequently permanent impairment of the function of the organ. It is probable also, that frequently recurring congestion may be associated with, if not the cause of, a low form of inflammation, in which fibroid and other deposits are met with. The arrangement of the vessels of the liver, renders the appearances of congestion in a section somewhat peculiar. In a slight degree of congestion, the radicles of the hepatic vein in the centre of each lobule are alone affected. A number of small spots will then be visible, surrounded by healthy hepatic tissue.

This is *hepatic venous congestion of the first degree*, and is often nothing more than the stagnation of blood in the vessels which occurs at the moment of death. When the congestion is greater in degree, it extends to the interlobular veins (the portal capillaries), and then a section presents a number of pale spots surrounded by a reddish ring. Should the congestion have been of long continuance—as for example in disease of the heart—the liver presents an appearance which has been compared to a nutmeg. It is somewhat firm and hard, and when incised, three colours—red, white, and yellow—can be distinguished, and which are more or less blended together. The red part corresponds to the distended hepatic venous plexus in the centre of the lobule; the white to the empty portal plexus at the edge of it; the yellow, which is between the two other colours, to biliary engorgement. The miscroscope shows that the cells at the centre of the lobules contain hæmatine and pigment, whilst those at the circumference are filled with fat globules.

Causes of congestion.—Congestion may be occasioned by pulmonary or cardiac disease, or induced by any obstruction to the venous circulation in the upper vena cava or hepatic vein. It is also not uncommon in the altered states of the circulation, which occur in the course of malarious and other fevers. The absorption of imperfectly assimilated food has been assigned as a frequent cause, but its importance has probably been overrated—exposure to the sun is sometimes a cause, and so also is the abuse of alcoholic liquors. In tropical countries, congestion of the liver is believed to be very frequent, and many slight ailments are attributed to it, even when there are no signs of enlargement. Unless the limits of the hepatic region are extended, we are, as Dr. Morehead justly observes, scarcely warranted in believing that the liver is congested.

Treatment.—The cause must be sought for and if possible removed; failing in this, should the patient be sthenic, the bowels are to be freely acted upon by active aperient medicine, in which calomel or blue pill may be an ingredient; and the diet should be restricted. In asthenic persons purgatives must be given with caution, and are to be preceded by a mild mercuria preparation. Should the enlargement continue, taraxacum and nitro-muriatic acid may be given, and occasionally a mercurial alterative. The hepatic region should be sponged with the nitro-muriatic lotion.

Increased biliary secretion.—Amongst Europeans newly arrived in a tropical country, owing to excess in eating and drinking, and exposure to the sun, bile is sometimes secreted in excessive quantity. Passing into the intestinal canal, it produces a severe form of diarrhœa, known as bilious cholera (page 226). This is rare amongst persons who are acclimatized, and almost unknown in the natives of the country.

Defective biliary secretion.—The secretion of bile is assumed to be defective, when the alvine discharges are of a white or clay colour. When thus altered, they are sometimes formed, but often loose, and passed more frequently than usual. The patient complains of languor, depression, and loss of appetite; the tongue is often but little coated, and there is no fever and no jaundice. The subjects of this derangement are often anæmic children, or grown-up persons who are cachectic from long residence within the tropics, malaria, or other causes. The condition just described, has been attributed to torpor of the liver, but it is probable that bile is wanting, not so much from inactivity of that organ in separating its constituents from the blood, as from those constituents themselves being deficient, in consequence of the metamorphosis of tissue being but little. Such cases are best treated by a moderately nutritious diet, tonic remedies, and occasional mercurial alteratives. The right side may be sponged with the nitro-muriatic lotion, and nitro-muriatic acid given internally in combination with taraxacum. Attention must be paid to clothing, and sudden changes of temperature avoided. In the case of Europeans, change to a temperate climate will become a matter for consideration. Although we may believe that the liver in many instances has little to do with the defective secretion of bile, yet its condition should always be carefully inquired into.

Fatty liver.—It is not uncommon to find the liver charged with fat or oil. When thus affected, it is generally, though not always, enlarged and of a pale cream colour. Externally it is marked with red or orange spots, whilst internally it is pale yellow. It is greasy and unctuous to the feel, and bibulous paper applied to its cut surface is stained. When heated, oily matter exudes. There are two forms of fatty liver: in one the cells are charged with fat globules, but their integrity is complete,—this is hardly disease, being always produced when certain kinds of food are taken, and removed when the diet is changed: in the second or true fatty liver, the cells are not only charged with fat globules, but many of them are broken up and destroyed. The true fatty liver is present in many diseases and conditions, as for example, in phthisis and Bright's disease, and in persons whose habits are sedentary and food too nutritious, or who have been long bed-ridden. It has been said, that fatty degeneration of the liver is unusually common amongst European soldiers in India, and that it is due to their food being too abundant in proportion to the amount of exercise taken. The information upon which this opinion is founded is somewhat defective, and can scarcely be considered to warrant the inference that has been drawn from it. At the same time it is certain, that the habits of the European soldier in India are such, as would seem calculated to favour the degeneration which has been thought to have been proved to exist.

Cysts in the liver.—Two kinds of cysts are met with in the liver:—1, a simple cyst, containing fluid only; 2, a cyst having other cysts within it—these latter are of the nature of entozoa, and have been long known as "acephalocysts" or "hydatids." The *simple cyst* may be imbedded in the substance of the organ, or occupy its edge or surface. It sometimes attains a large size, and has been known to give way, the contents being effused into the cavity of the abdomen. There is in general but one cyst, but sometimes there are several. The *acephalocyst* or *hydatid cyst* is common, more so in the liver perhaps than in any other organ. The cyst is sometimes single, but more frequently two or three are present. It consists of an external fibrous membrane, the outer surface of which lies in contact with the hepatic tissue, whilst the inner surface is lined by epithelium. Inside this large cyst is another of smaller size, and within it numerous still smaller cysts, varying in size from a small pea to an egg, and which float in a clear pellucid fluid. Within the smaller cysts there are others still smaller, until perhaps a fourth generation is reached. In the interior of the most minute cysts, there is a little oily or granular matter, in which lies imbedded a group of minute creatures called echinococci. They are described as being from $\frac{1}{235}$ to $\frac{1}{75}$ of an inch in length, and from $\frac{1}{300}$ to $\frac{1}{100}$ in width. The head resembles that of the tænia, having suckers and hooklets.

The hydatid cyst sometimes remains for a long time without change, but various morbid processes may be set up in it. Thus, it may become inflamed and converted into an abscess, which may follow the ordinary course of hepatic abscesses, viz. by either making its way towards the surface or some other channel of exit—as the lungs or intestinal canal. At other times the cysts shrivel and undergo fatty or calcareous degeneration.

There are no means of recognizing the existence of a cyst in the liver, until the fluid has so increased in quantity, that fluctuation is perceptible; and then it may be difficult to distinguish it from abscess.

There are other entozoa occasionally, though rarely met with, in the liver: a lumbricus has been found in the centre of an abscess,* and guinea worm has been seen in the substance of the organ, once by myself.

Cancer of the liver.—Cancer of the liver is common in all its forms as a secondary, but very rare as an idiopathic disease.

The symptoms are those of chronic hepatitis, with in general much enlargement of the organ. In the scirrhus variety the nature of the affection may be sometimes made out during life, by irregularity of the surface of the liver, from the presence of nodules or tumours, which, from softening or ulceration, are often depressed at the centre. The treatment is entirely palliative.

Lardaceous or amyloid degeneration of the liver.—In certain cachectic states, especially scrofulous, syphilitic, and mercurial cachexia, the liver and some other organs are the seat of the deposit of a soft translucent substance, which has been compared to wax or tallow. When thus affected, the liver sometimes becomes enormously enlarged, occupying a considerable part of the abdomen, and has been known after death to weigh eight or ten or even more pounds. It is firm and hard, and on cutting into it, a sensation is felt like that of cutting through lard or bacon rind.

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* "Researches on Disease in India," page 364, Case 137.

The cells and secreting structures are destroyed, and the function impaired, whilst the pressure of the deposit may lead to obstruction of the circulation, and secondary derangements similar to those in cirrhosis.

The nature of the deposit has been only lately, if it is now fully, determined. In its cheminal reactions, it is believed to bear a close resemblance to starch, or more correctly cellulose. It appears to be deposited at first into or between the coats of the small arteries, and afterwards into the surrounding parenchyma. It is seldom limited to the liver, but usually involves at the same time the spleen and kidney. The lardaceous or amyloid liver is common in phthisis, and still more so in persons affected with scrofulous caries.

In the treatment, beyond the attempt to improve the general health, and to remove secondary derangements, it is doubtful if anything can be done. The lardaceous liver is not of common occurrence in tropical countries, and I think Dr. Morehead's opinion, that it or a similar condition of the liver is caused by malaria, requires confirmation.*

ICTERUS.—*Jaundice, Morbus Regiis.*

These terms are used to designate a disease in which there is yellowness of the conjunctivæ, of the skin, and other textures, from the colouring matter of the bile being mixed with the blood.

Symptoms.—Jaundice sometimes sets in suddenly, but is more frequently preceded by languor, lassitude, and depression of spirits. The yellowness first appears in the conjunctivæ, afterwards on the face, and thence extends to the neck and body, and becomes general. There is usually tenderness of the epigastrium, with thirst, nausea, and complete loss of appetite. The sleep is disturbed; and in some instances a tendency to drowsiness and stupor is noticed, and in all an incapacity for mental exertion.

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* "Researches on Diseases in India," page 428.

The pulse is slow, the tongue furred, and the bowels constipated—the evacuations being very often, though not always, pale coloured. The urine is high-coloured and passed with scalding: mixed with nitric acid in a test tube it becomes green; if a drop of it is placed on a piece of glass or a white plate, and a drop of nitric acid by its side, so as to mingle with it, a play of colours—pale green, violet, and red—is observed. When there is no organic disease, the jaundice and other symptoms sooner or later subside. There is, however, a very fatal form of jaundice characterised by adynamic symptoms, with a tendency to pass into early coma and death. The urine has been found to contain needle shaped crystals (leucine) and rounded masses (tyrosine). The limits of the hepatic region are said to be much diminished. This form of jaundice is often called "yellow atrophy of the liver;" it is either rare, or has seldom been recognised in tropical countries.

Pathology and causes.—The pathology of jaundice is obscure. It may be due—1*st*, to deficient elimination of the constituents of the bile from the blood; 2*nd*, to obstruction in its passage into the intestines, and consequent reabsorption.*

1*st.*—Deficient elimination may arise from—(*a*) congestion of the portal vessels; (*b*) destruction of the hepatic cells; (*c*) impairment of their functions.

Congestion is probably a common cause, and explains the occurrence of jaundice in malarious and other fevers. It partly acts by lessening the quantity of blood which circulates through the organ, and partly by pressing upon the hepatic cells, and thus interfering with their function.

The destruction of the hepatic cells is caused by certain poisons in the blood, as of the snake; also by long-continued biliary or vascular congestion, and perhaps also by mental emotion. The liver is reduced in size, and is flaccid and pulpy; the cells are no longer visible, disintegrated hepatic tissue, oil globules, and the crystalline bodies leucine and tyrosine are substituted for them.

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* It is said, that these different modes of production may be distinguished, by observing that, in *the one case,* the urine alone contains the constituents of the bile which exist in the blood, *in the other* the bile acids as well. The examination is very simple. To two and a half drachms of urine, half a drachm of strong sulphuric acid is added; if at the moment of contact a scarlet or purple colour is produced, the acids of the bile are present, and the jaundice arises from reabsorption; if there is no such effect, the case is one of non-secretion.—*Harley, British Medicine Association Journal, June* 14*th*, 1862. Dr. Harley's observations require confirmation.

The colouring matter of the bile is also imperfectly eliminated in those conditions of the liver in which fibroid tissues are developed. Lastly, the constituents of the bile may accumulate in the blood, not from any defect in the secreting organ, but because they are formed in excessive quantity.

2nd.—The bile being obstructed in its passage into the intestines, may produce jaundice, by—(*a*) the reabsorption of the colouring matter; (*b*) by preventing its elimination from the blood.

The causes of obstruction are very numerous. The *mechanical* are biliary calculi, enlarged head of the pancreas, distension of the colon from fæcal accumulations, the gravid uterus, malignant and other tumours of the stomach or in the small omentum, a lumbricus in the ducts, viscid mucous, and stricture, &c. The *other* causes are spasm and inflammation of the duct, and inflammation of the duodenum. How the latter acts as a cause of jaundice is not very apparent. The swelling and turgescence of the mucous membrane may possibly obstruct the orifice of the ductus communis choledichus, or the inflammation extending along the duct, cause spasm. The morbid appearances in jaundice are very various: sometimes the cause can be readily ascertained in the presence of some mechanical cause of obstruction, at others no disease either of the liver or ducts can be detected. The tissues generally, and the fatty in particular, are more or less of a yellow colour.

The influence of mental states in causing jaundice has been already mentioned. It seems also sometimes to be epidemic.* Notwithstanding all that has been written on jaundice, its causes and pathology are still very obscure.

Treatment.—As our knowledge of the pathology of jaundice is very imperfect, its treatment is necessarily unsatisfactory.

Should there be enlargement of the liver, and tenderness beneath the margins of the ribs, leeches may be applied, and the bowels be freely acted upon by an active aperient. If there is reason to believe that obstruction exists, the cause of the obstruction must, if possible, be removed ; but frequently this cannot be accomplished, and then treatment will be of little service. When no cause for the jaundice can be discovered, mercury may be cautiously given with taraxacum and aperients. Nitric or nitro-muriatic acid may be taken, and the side sponged with the nitro-muriatic acid lotion. Saline diuretics are often useful.

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* Transactions of Medical and Physical Society of Bombay, 1st Series, No. X., page 28.

Gall stones.—Small calculi are apt to form in the gall bladder or biliary ducts ; they consist of cholesterine and inspissated bile. In passing along the ducts, they cause violent paroxysmal attacks of pain, which must be relieved by opiates, and the inhalation of chloroform. Once in the duodenum they escape with the fæces.

Diseases of the pancreas.—Of the diseases of the pancreas but little is known. The organ has been found enlarged, and its structure changed, sometimes from inflammation, but more frequently from cancerous formations or fatty degeneration. Calculous concretions in the pancreatic duct are common. The symptoms which have been noticed, when the pancreas is diseased, have reference to derangement of the stomach, which is probably produced by the pressure of the enlarged organ. Fatty stools have also in some cases been passed.

Diseases of the spleen.—The spleen no doubt is liable to inflammation and its results, but such disease is rare and of little pathological importance. Enlargement of the spleen, in connection with malarious fevers, will be afterwards considered.

CHAPTER V.

DISEASES OF THE KIDNEY.

Situation of the kidney.—The kidneys, imbedded in much fat, are situated at the back part of the abdomen, on a level with the last dorsal and two upper lumbar vertebræ. They are too deeply-seated to be affected by pressure from in front ; but if the patient lies on his face, with his thighs bent under the belly, firm pressure from behind, immediately beneath the ribs, will increase pain whenever there is inflammation; and an increase in the size of the kidney may even be sometimes detected. The important relations of the kidneys are, *on the right side* to the liver and ascending colon and duodenum; *on the left* to the spleen, stomach (when distended), and descending colon. The *anterior surface* is covered by the peritoneum, whilst the *posterior* rests upon the muscles and fascia of the abdominal wall.

NEPHRITIS.—*Inflammation of one or more, or all the structures of the kidney.*

ACUTE NEPHRITIS.—Acute nephritis is comparatively rare, except when it is caused by injury, calcareous deposits in the tubes or pelvis of the kidney, the extension upwards of inflammation of the bladder, or certain irritating matters in the blood.

Symptoms.—The leading symptoms are pain in the lumbar region, vomiting, and febrile disturbance. The attack usually commences with chills and shivering—often very severe—followed by fever and vomiting. Pain of the loins is an early, and may indeed be the first symptom; it is in general very acute, but sometimes there is rather a feeling of weight and uneasiness than actual pain,—its severity depends a good deal upon the implication of the peritoneal investment. Firm pressure increases the pain, as does also any sudden movement—as sitting up, bending forwards, coughing, sneezing, or taking a deep inspiration. The pain may be confined to the lumbar region, but in general it extends along the ureters to the neck of the bladder, and even to the inside of the thighs and testicles, which are sometimes retracted. The urine passed in small quantity* and with pain, is of a dark red colour from blood. Heat or nitric acid coagulates the albumen of the blood, and thus renders it turbid, and blood globules are seen under the microscope. Vomiting is an urgent symptom. In general there is febrile heat, a frequent and sometimes hard pulse, foul tongue, an anxious face, and much depression of spirits. The bowels are usually constipated, and the abdomen distended from tympanites.

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* The quantity of urine passed by healthy persons varies so much, and under so many circumstances, that it is not easy, nor perhaps very important, to fix an average. The quantity fixed by Dr. Prout, would seem from

Progress.—The symptoms may subside in a few days, the inflammation having been resolved; or, on the other hand, the secretion of urine becoming very scanty or suppressed, death may take place under coma. Sometimes the symptoms are of a typhoid character from the commencement, in which case the patient early becomes comatose. When, however, the termination is *not* in resolution or speedy death, the fever after a time assumes a hectic type, whence it may be suspected that suppuration has occurred, and this suspicion becomes a certainty, if a fluctuating swelling is perceived externally. The pus may make its way into the pelvis of the kidney, and be discharged along with the urine, or opening into the alimentary canal or externally, form a renal fistula.

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recent researches, to have been too low,* so far as regards temperate climates; it however agrees very much with my own observations upon the inhabitants of Bombay.—*Vide* Transactions Medical and Physical Society, No. VI., New Series, page 363. It is much more important to determine the amount of solid matter excreted. This can only be done with accuracy by careful chemical analysis; but an approximate estimate may be formed by referring to the following table, constructed by Dr. Golding Bird, from a formula by Dr. Christison:—

Specific Gravity.	Weight of one fluid ounce.	Solids in one ounce.	Specific Gravity.	Weight of one fluid ounce.	Solids in one ounce.
		Grains.			Grains.
1010	441·8	10·283	1025	448·4	26·119
1011	442·3	11·336	1026	448·8	27·188
1012	442·7	12·377	1027	449·3	28·265
1013	443 1	13·421	1028	449·7	29·338
1014	443·0	14·470	1029	450·1	30·413
1015	444·6	15·517	1030	450·6	31·496
1016	444·5	16·570	1031	451·0	32·575
1017	444·5	17·622	1032	451·5	33·663
1018	445·9	18·671	1033	451·9	35·746
1019	445·3	19·735	1034	452·3	36·831
1020	446·8	20·792	1035	452·8	37·925
1021	446·6	21·852	1036	453·2	38·014
1022	447·1	22·918	1037	453·6	39·104
1023	447·5	23·981	1038	454·1	40·206
1024	448·0	25·051	1039	454·5	41·300

* "Thudichum on the Pathology of Urine."—*Edinburgh Medical Journal.* "Parkes on Urine."

When the pelvis of the kidney is chiefly or alone inflamed, there is less danger of coma, or of the urine being suppressed; the pain is also said to extend more frequently to the testicles, and hectic fever to be better marked. But the chief distinction is in the character of the urine: it is not scanty, though frequently passed, and always contains ropy mucus and often pus.

Chronic nephritis.—Acute is said to end sometimes in chronic nephritis, but the latter much more frequently arises independently of an acute attack. The symptoms are ill-defined when the secreting portion of the organ is affected—frequent micturition, gradually increasing emaciation without any obvious cause, and hectic accessions of fever, are those generally noticed. If with these symptoms the urine is passed alkaline and turbid, there is little doubt of the kidney being diseased. So long as the inflammation is confined to the cortex, it is probably often overlooked, but when, as generally happens, it extends to the pelvis, the urine is mixed with mucus and pus, and the condition of the kidney then becomes apparent.

Diagnosis.—Nephritis may be distinguished from nephralgia by the febrile disturbance and the less paroxysmal character of the pain; from lumbago by the pain being felt even in the recumbent posture and when the patient is quiet, and not so much increased when the attempt is made to assume the erect posture; by the vomiting, retraction of the testicles, and derangement of the urinary secretion.

*Morbid appearances.**—In the early stage the kidneys are much enlarged, the capsule is easily removed, and the surface bright red, or mottled, and dotted with points of ecchymosis. On section, much blood oozes out, and dark specks (Malpighian bodies) are seen. The lining membrane of the pelvis is reddened, and in the more advanced stages there are small abscesses, or pus is infiltrated through the cortical part, or collected in the pelvis, so as to expand it and the calyces into a large pouch, the cortical part being atrophied. In the pelvis, ulcers and even gangrenous patches are sometimes seen, but gangrene of the substance of the kidney is very rare. In chronic inflammation of the cortex, the kidney is diminished in size, hard, and sometimes granular on the surface. Nephritis is usually associated with calculi or irritating matters—as cantharides, turpentine, &c. excreted from the blood. It is also said to occur in connection with the gouty and rheumatic diatheses. Inflammation of the pelvis is often dependent upon disease of the bladder, or obstruction to the passage of urine.

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* The average length of the kidney is from 4 inches to 4½ inches, its breadth 2 inches, and its thickness rather more than 1 inch. The average weight is about 4½ ozs. in the male, and somewhat less in the female. The two kidneys are seldom of equal weight, the left being generally heavier than the right. The cortical substance and its prolongation, are from 2 to 3 lines in thickness.—*Dr. G. Johnson on Diseases of the Kidney.*

Causes.—The more common causes of nephritis are blows in the lumbar region; certain matters in the blood—as cantharides, corrosive sublimate, digitalis, &c.—calculi or calcareous matter in the tubes, the pelvis, or ureter; extension upwards of inflammation from the bladder; pre-existing disease of the kidney—as cancer—impediment to the passage of urine, the gouty diathesis, exposure to cold, &c.

Treatment.—At first, should there be much fever, and the patient sthenic, general blood-letting will be required—otherwise, the local abstraction of blood by cupping in the lumbar regions is sufficient. The bowels should be freely acted upon by castor oil, or a large enema when the stomach is too irritable to retain medicines. The pain, which is often severe and paroxysmal, will be relieved by opium, which may be used as a pill, suppository, or enema. The loins should be well fomented, or what is better, the patient may be made to sit in a hip bath. When there is not much vomiting, mucilaginous drinks may be freely taken, so as to dilute and render the urine less irritating. When the skin is dry, hot, and harsh, diaphoretics are serviceable, and if the stomach will bear it, antimony [illegible] in small doses may be combined with them. When a calcareous diathesis exists, the preparations of potash and soda often give relief, and especially when the urine is acid.

Treatment of chronic nephritis.—In the early stage, local bleeding, cautiously employed; counter-irritants, but not cantharides, and medicines which improve the general health and secretions, are indicated. When the disease is advanced, and the urine contains mucus or pus, those medicines are useful which pass through the kidney, and exert some kind of influence upon its capillary circulation: the infusion of pareira or of the uva ursi, or of the diosma, are perhaps the best of the vegetable infusions. In many instances however, the balsams and turpentines are more efficacious, but their effect must be watched, as they sometimes produce irritation, when of course they should be omitted.

BRIGHT'S DISEASE.—*Albuminuria, granular degeneration of the kidney*, &c.

Bright's disease is so named after the distinguished physician by whom it was first brought to notice. It comprises those morbid conditions of the kidney in which, during some part of their course, albumen is found in the urine.* It may be said to consist in an altered state of the kidney, characterized by deposits in or between the uriniferous tubes, and changes in the epithelial cells of the secreting part of the organ; to which may be added a tendency to various secondary inflammations and degenerations, and a diminution of the red corpuscules of the blood; these conditions being generally accompanied by dropsy and an albuminous state of the urine.

The connection between dropsy, albuminous urine, and certain diseased states of the kidney, was pointed out by Dr. Bright in the year 1827. The condition of the kidney has since been carefully investigated, and of late years by the aid of the microscope. Dr. Bright's observations have been confirmed, and our knowledge of renal diseases extended.

Symptoms.—The symptoms of Bright's disease may be conveniently arranged in three groups or classes, so as to constitute *three forms.*†

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* These do not include albumen from pus or blood in the urine, nor its occasional presence from obstruction to the venous circulation, as in pulmonary and cardiac diseases; or from errors in the assimilative process in connection with febrile diseases, diet, and the like.

† It is not meant that these are three distinct forms of disease, which never pass the one into the other, but merely that they exhibit special characters, by which each may be distinguished during life, and which are related to peculiar morbid conditions of the kidney.

1*st or acute form.*—After exposure to cold when heated, or after an attack of scarlet fever, rigors set in with slight pain of the loins and sometimes vomiting. The shivering is followed by heat of skin and general dropsy—the swelling first appearing in the face—the urine is small in quantity, passed frequently and with pain, and of a reddish or dark brown colour (smoky), from being mixed with blood.* Its specific gravity may not be below the normal standard, but considering the small quantity of urine passed it *is* low. Upon the application of heat or nitric acid, the urine becomes almost solid. If allowed to stand for a short time, it deposits a reddish sediment, which under the microscope is found to consist for the most part of masses of fibrine, fibrinous casts containing epithelial cells, blood globules, exudation corpuscules, and crystals of lithic acid. In some of the epithelial cells, a few oil globules will usually be seen.

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* The urine should be collected in a bottle graduated to ounces and pints. Great care must be taken that the bottle is quite clean; if any mucus or slime should be left from a former collection, it will act as a ferment, and cause decomposition. In tropical countries this will happen within a few hours. The urine passed the first thing in the morning should be selected for examination.

The quantity, odour, and colour having been noted, a slip of blue litmus paper is to be immersed in the urine; should it be reddened, the reaction is to be noted as acid; should no effect be produced, a slip of reddened litmus is to be used; if the blue colour is restored, the reaction is alkaline; should no effect be produced upon either the blue or reddened litmus, the urine is neutral. The specific gravity is now to be taken by the specific gravity bottle or Urinometer—the proper correction in either case being made for temperature. In Bombay, where the mean temperature is about 80°, an addition of 2 will be sufficiently accurate.

Test for albumen.—When the urine is acid, a little of it is to be placed in a test tube and heated over a spirit lamp; it may remain clear or become turbid. In the former case, we may be sure there is no albumen present; in the latter case, the turbidity depends either upon albumen or an excess of the phosphates. To determine this point, a drop or two of nitric acid is added; if phosphates are present, the urine will become clear, if albumen, no effect will be produced. When the urine is alkaline, nitric acid should be added drop by drop; should the urine become turbid, the turbidity may either be from albumen or urates; if from the latter, it will be dissipated by heat. In all cases, both heat and nitric acid should be used. Heat will not coagulate albumen when the urine is alkaline. When urine contains a large quantity of urates, nitric acid will cause turbidity. It should also be observed, that a small quantity of nitric acid in albuminous urine, will prevent albumen being coagulated by heat.

Progress.—The patient may be carried off rapidly by an intercurrent inflammation; or the secretion of urine being more and more scanty, he becomes sluggish and drowsy, and afterwards comatose, death taking place within a few hours, or at the most a few days. But this is not common—more frequently the termination is in recovery or degenerative disease. When recovery is about to take place, the urine increases in quantity and loses its red colour; the albumen and sediment are less, and the dropsical symptoms disappear. The epithelial casts are no longer seen, a few transparent or faintly granular casts being alone visible. In less favourable cases, the dropsy persists, increases, or recurs; albumen continues in the urine, which becomes more copious, but still deposits a sediment, and there is a marked tendency to anæmia. Sometimes, indeed, there is little or no dropsy, the blanched and anæmic condition of the patient being the chief or only general indication of the disease not having been removed. The tongue is thinly furred in the middle, and generally somewhat florid at the tip and edges; the bowels are irregular—constipation and looseness alternating with each other. In cases of doubt, the urine should be examined by the microscope. It will be found to contain casts, in which there are cells (abortive) more granular than the epithelial, free nuclei and granular matter, shining particles (oil globules), single or in clusters scattered over the field of the microscope. With these appearances, a state of general anæmia and general dropsy, there can be little hesitation in deciding that the disease has become degenerative.

2nd form.—This is sometimes the advanced stage of the form which has just been described; but more frequently it sets in slowly and insidiously, without any evidence of an acute attack. There is often a period of variable duration, before the characteristic symptoms are developed, during which the health is deranged: the digestion is impaired, the patient daily loses flesh and strength, and looks white and pasty, the least exertion causes giddiness and palpitation, the skin is dry and harsh, there are fugitive pains in the loins, and sometimes frequent micturition. At last œdematous swelling is observed, appearing first in the face, usually in the lower eyelid, at which time, or even before, a peculiar watery state of the conjunctivæ may be noticed, and which is due to effusion into the sub-conjunctival tissue. The dropsical swellings extend to other parts, and in most cases rapidly increase; the face is pale, and where this cannot be observed in persons whose skin is dark, the pale and exsanguined appearance of the lips and gums will be sufficient evidence of the anæmic condition, which is so marked a feature of this disease. The breathing is oppressed from more or less pulmonary œdema, and from the same cause, or intercurrent bronchitis, there is cough with frothy expectoration. The pulse presents no uniform characters—its frequency is influenced by the presence or absence of fever, and its size and strength by the stage of the disease and constitution of the patient. Pain is sometimes felt in the lumbar region, but is more often absent. The urine varies much in quantity, and is often neither copious nor scanty, and of natural colour and appearance; but sometimes it is pale yellow or smoky, or of a pale lemon colour. Its specific gravity is below, but often not much below the natural standard. The sediment exhibits under the microscope different appearances, according to the stage and nature of the disease, and the kind of morbid deposit which exists in the kidney. In some instances imperfectly formed or degenerated epithelium is freely shed—the cells being granular (abortive), or for the most part wanting, free nuclei and granular matter taking their place. Many of them are often charged with fat globules, and these may also be seen scattered over the field. In some instances there are casts charged with fat globules (fatty casts), in others the casts are almost transparent (waxy), consisting of a transparent homogeneous substance, which has been likened to wax. In the early stage, blood globules and exudation and pus corpuscules are present, but they generally disappear as the disease advances. The size of the casts varies according as the epithelial cells have or have not been removed by disorganization.

Progress.—Before dropsical symptoms set in, there may have been impairment of the health for months or even years, without any marked sign of local disease. When dropsy has occurred, it usually increases, and not unfrequently the swellings attain a great size. It is attended with progressively increasing anæmia, and a tendency to secondary or intercurrent inflammations. Pulmonary œdema is always to be feared, as is also the occurrence of coma, from great diminution in, or suppression of, the secretion of urine. The dropsy may often be removed by suitable treatment; otherwise it increases, the large serous sacs become more and more filled, and the function of important organs is interfered with, hence dyspnœa, palpitation, &c. The anæmia also increases, the bowels often become loose, vomiting not unfrequently sets in, and the patient sooner or later sinks under asthenia, if not carried off at an earlier period by an intercurrent affection.

3rd form.—The symptoms of this form are obscure and have often reference to other organs than the kidney—thus, there may be pneumonia, pleuritis, &c. In the absence of intercurrent or secondary disease, a state of general anæmia, headache, dimness of sight, noises in the ears, giddiness, dyspeptic derangements, attacks of diarrhœa, are the chief symptoms. There is no dropsy, but in general a watery state of the conjunctivæ, and œdema of the feet towards evening may be noticed. The urine is abundant, even more so than in health; it becomes cloudy on the application of heat and nitric acid, but does not deposit any sediment. The microscopic appearances are not at all characteristic, few or no casts are visible. In some cases, twitchings of the muscles, or even slight convulsive attacks are observed, and these may be followed by fatal coma. Indeed, the usual termination of this form of the disease is in coma, which often occurs suddenly and without premonitory symptoms.

Diagnosis.—Under ordinary circumstances in Bright's disease, there is but little difficulty in forming a correct diagnosis. The acute form may be distinguished from nephritis, by the dropsy and the epithelial casts in the urine. The chronic form, unattended with dropsy, resembles diabetes insipidus, which no doubt has often been mistaken for it. In both there is copious secretion of urine of low density. The occasional presence of albumen—the œdema of the feet towards night, œdematous conjunctivæ, and the general anæmia, will be sufficiently characteristic of Bright's disease.

Pathology.—Morbid Anatomy.—Just as three groups or classes of symptoms are typical of three stages or forms of Bright's disease, so may three equally typical conditions of the kidney be recognised ofter death. They may be related to the forms or stages of the disease just noticed, and are known as the *large red kidney*, the *large white kidney*, and the *small contracted kidney*. The *large red kidney* is met with in fatal cases of the acute (1st form) form of Bright's disease, when death has occurred within two or three weeks. The organ is enlarged, weighing from six to twelve ounces or more, and of soft consistence. The capsule is easily removed, and the surface is of a red colour, with pale-looking patches from exudation, and here and there spots of intense redness (ecchymosis), due to effusion of blood into the convoluted uriniferous tubes. On section there is much oozing or dripping of blood, and the cortical substance is increased, and encroaches on the pyramids. Its cut surface is of a red colour and studded with numerous spots more deeply red, owing to effusion of blood into the Malpighian capsules. The pyramids are reddened, and for the most part compressed by the processes of cortical substance, which are situated between them; their bases, however, are expanded in the cortical substance. When examined by the microscope, the tubes are found to contain epithelial cells, fibrinous matter, exudation and blood corpuscules, and very generally crystals of lithic acid.

Large white kidney.—The large white kidney is related to the second group of symptoms, and is often considered as the typical form of Bright's disease. It may be a more advanced stage of the large red kidney, or its characteristic appearances may be detected from the commencement of the disease. In size it often exceeds that of the kidney just described, and its capsule is separated with equal ease. The surface is smooth, of a grayish white colour, but mottled with red spots or streaks. The cortical part is much increased in thickness, paler than natural, and soft and friable. When pressed, a milky-looking fluid exudes, and whitish-looking lines are seen running from the surface inwards, which are believed to be tubes and Malpighian bodies filled with, and surrounded by, exudation. Sometimes the cut surface has a white homogeneous appearance, at others it is of a yellowish colour, and studded with minute white granular bodies (granular degeneration). The pyramids are swollen, of a reddish colour, and have a striated appearance. The lining membrane of the calyces is also swollen and reddened.

Microscopic appearances.—The Malpighian bodies are altered —some being increased, others diminished in size—they contain granular and oily matter, as do also the tubes in connection with them. The capillary tuft is usually wasted, but sometimes the capillaries are much thickened. The tubes are very generally distended with imperfectly formed or degenerated epithelial cells, free nuclei, and granular matter. In some of the tubes coagulated fibrin is found. In many instances the cells are charged with oil globules.

Various modifications in the size and appearance of the kidney are observed, due no doubt to the varying quantity and situation of the blood in the capillaries and the nature of the deposit—thus, it is sometimes mottled or marbled, and has on section a homogeneous or granular appearance. The enlargement may not always be due to accumulation within the tubes—fatty matters often accumulate in, and take the place of, the intertubular substance, being most probably a metamorphosis or degeneration of inflammatory effusion; or the deposit may be a translucent wax-like substance, to which the terms lardaceous, waxy, or more recently amyloid, have been applied. This latter condition is often associated with a similar condition of the liver and spleen, and is most observed in persons who are scrofulous or have suffered from syphilis. In the advanced stages of the disease, the kidney may occasionally be diminished in size from emptying and collapse of the tubes, and shrivelling or other change in the intertubular deposits, and both on its surface and in its interior may have a granular appearance; but it is doubtful if it ever assumes the characters of the kidney about to be described as the *small contracted kidney.*

Small contracted kidney.—The kidney is not half the natural size, and the capsule thickened and opaque is firmly adherent. The surface is lobulated, or nodulated, hard, red, and granular. The cortical part is wasted, and the cut surface coarse, fibrous, and granulated.

Microscopic appearances.—The tubes are empty, without epithelium, and are so closely packed together, as to resemble fibrous cords.

There has been much discussion as to whether the small contracted kidney is a more advanced stage of the large white kidney: I believe the negative view at the present time predominates. That a large kidney may in time, by the emptying of the tubes, and contraction of inter-tubular deposits, shrivel and at length become smaller than the healthy kindey, is certain ; but there is not sufficient reason for concluding that it ever assumes the hard nodulated character of the small contracted kidney. This much does not admit of dispute, viz., that the symptoms of the large white kidney may exist for a long time, and terminate in death without the kidney showing any sign of diminution in size : and conversely, the small contracted kidney is often found where there have been wanting during life *all* the symptoms that usually attend upon the large kidney.

State of the blood in Bright's disease.—That the blood undergoes some kind of change previous to the occurrence of renal derangement is more than probable, but what the nature of that change is we do not know. After the disease has been fairly established, the albumen and red corpuscules are diminished, and the urea and water increased. In the acute forms, the fibrin is in more than the usual proportion, and the blood coagulates into a firm thick clot, having a buffy coat. The density of the serum is much diminished, not being more than 1,020 or 1,015, whilst in health it is 1,030. In the more advanced stages however, its proportion to the clot becomes large, and it regains its natural density. The nature of Bright's disease is not positively known. The local affection is preceded by an altered state of the blood, which may in itself lead to structural changes in the kidney as in other organs, without the occurrence of active determination of blood or inflammation. But it is quite certain, that when the blood is so altered, a determination to, or stasis of blood in the organ, is often the immediate exciting cause of the changes that follow; and it is in this way, that cold applied to the suface of the body, is often so frequent an exciting cause. That determination or inflammation would produce Bright's disease without some pre-existing blood derangement, is altogether improbable. In many cases, the disease appears to commence in the uriniferous tubes, the epithelium of which freely desquamates. The desquamation has been attributed to a materies morbi in the blood seeking for elimination at the kidney, but this requires further investigation. In other cases, the deposit is mainly into the inter-tubular tissue, and the epithelial cells are little effected, unless the tubes are destroyed by the pressure of the new material. The nature of the deposit is various. It may be fat, fibrin, or a transparent substance, now called "amyloid," on account of its chemical relations with iodine being similar to those of starch. The nature of the small hard kidney has been much discussed, and the question is not yet settled—there seems little doubt that there is an intertubular deposit, but whether the result of a low form of inflammation, or of a more degenerative process, is uncertain. Some think the deposit is into the matrix of the organ, whilst others doubt if any matrix exists. In any case, a sort of contraction of the deposit takes place—the secreting structure is pressed upon and destroyed.

Dropsy in Bright's disease.—Dropsy in Bright's disease occurs under different circumstances, viz. in the acute form, when the vessels are filled or distended in the blood; in the chronic form, when the vessels are partially filled and the blood thin and watery.

The usual explanation of the occurrence of dropsy in the acute form is, that the vessels being filled with blood abounding in watery fluid, which should have been excreted by the skin and kidneys, transudation of the serum takes place from over distension. In the chronic form, the change in the physical condition of the fluid would seem to favour transudation.*

Cerebral symptoms.—Cerebral symptoms occur in all the forms of Bright's disease, but are most common when the kidney is small and contracted. In the few cases of Bright's disease as yet recorded amongst the natives of India, they appear to have been less common than might have been expected.* The cerebral complication is due to the accumulation in the blood of those solid matters which should have been excreted by the kidney; but we are yet in the dark as to which of them is the poisonous agent.

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* I have not alluded to other explanations of the cause of dropsy founded upon the presence of urea in the blood. The poisonous or other properties of urea are not determined, and consequently the time has scarcely arrived for making its presence in the blood the basis of a pathological hypothesis.

Secondary inflammation.—The occurrence of inflammation of various tissues and organs in the course of Bright's disease has been so often remarked, as to leave no doubt that some kind of relation exists between them and the state of the kidney. The serous membranes are often affected, and consequently pleuritis and peritonitis are common. There is, indeed, scarcely an organ which is not rendered more liable to disease. The heart is believed to be frequently affected. It is asserted that valvular disease, when unconnected with rheumatism, is generally related to it. Dr. Morehead, however, found in fifty-eight cases of Bright's disease, treated in the Jamsetjee Jejeebhoy Hospital, disease of the valves in five cases only. There would therefore appear to be need of further investigation, so far as regards tropical climates, before the frequency of this connection can be considered to have been established. Simple hypertrophy, without valvular disease, as the consequence of Bright's disease, is also said to be common. Dr. Morehead, in his fifty-eight cases, did not meet a single example of it; nor have I, in post mortem examinations, once observed it. This point will be further discussed under cardiac diseases.

Cysts.—These are common in the kidney—some are visible to the naked eye, others are only apparent under the microscope. They vary in number from one or two to many hundreds or thousands. The larger cysts are found on the surface even when there is no structural disease, but if small and numerous, they are never met with in a kidney otherwise healthy. The contents are generally fluid, but sometimes jelly-like or even solid. The constituents of the urine are said to be rarely found in them. The microscopic cysts, though often present in the atrophoid kidney in Bright's disease, are by no means restricted to it. They are common in wasted kidneys from other causes. The exact mode of formation of these cysts is not yet satisfactorily determined. There is little doubt that some may be formed by simple dilatation of the uriniferous tubes, but the microscopic cells are with good reason referred to an increased growth or development of the epithelial cells. It is supposed that the tube bursts and sets free the cells which have become enlarged. The significance of cells, as evidence of a peculiar diseased condition of the kidney, is comparatively little.

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* It is I think probable, that some of the deaths recorded under cachexia and remittent fever may be due to Bright's disease.

Causes.—The chief causes of "Bright's disease" are exposure to cold, especially after scarlet fever, and the abuse of alcoholic liquors. It is probable also, that the condition of the blood, *i. e.* cachexia, which appears essential to the production of Bright's disease, may be induced by the too free use of narcotics—as of opium, ganja, or by exposure to malaria. But it must be admitted, that very frequently no adequate cause can be ascertained. The cause of the secondary complications is not well known: great stress has been laid upon the presence of urea in the blood, but even admitting its poisonous properties, and its accumulation in excess in the blood, there is difficulty in comprehending how it can produce the effects ascribed to it. In chronic cases however, it may be questioned if it does exist in excess in the blood. Dr. Morehead justly observes, that "when an important organ becomes gradually unfit for function, then all the other actions of the system gradually harmonize with this defect. The lungs, slowly unfitted by tubercular deposit, or the liver by cirrhosis, does not lead to excess of carbonic acid or of bile in the blood, but to an anæmic state of the general system. The blood is by degrees reduced to the quantity which these imperfect organs are capable of depurating. For a similar reason, when the kidney becomes gradually disabled, it follows that there will be defect of urea in the urine, but by no means necessarily excess of this excretion in the blood. On the contrary, the inference from analogy is, not that there will be excess of urea in the blood, but that the blood will be brought down to that quantity which the kidney is competent to purify."

Treatment.—In the acute form, viz. that arising from cold or following scarlet fever, the treatment must be conducted on antiphlogistic principles. Blood is to be abstracted generally or locally, according to the patient's general condition; the secretion of the skin is to be excited by the use of the warm or vapour bath, and free secretion from the intestinal canal promoted and maintained by aperients. The extent to which depletion is to be carried, must be left to the judgment of the practitioner, the tendency to diminution of the red corpuscules, which is so characteristic of this disease, being always kept in mind. In tropical climates, it would not be safe in most instances to continue purgatives after the first two or three days; small doses of tartar-emetic ought to be substituted for them. The regimen should be antiphlogistic for a few days. When the urine has become copious, the blood globules have disappeared, and the fever has diminished or is altogether gone, 15 to 20 minims of the tincture of the sesquichloride of iron may be given. Should the dropsy by this means not be removed, diuretics may be tried—they are better avoided, and should on no account be used whilst the urine is scanty and high coloured. As the dropsy subsides, and the secretion of urine is restored, ferruginous tonics should be prescribed, and of these, the tincture of sesquichloride of iron is the best. When the skin is dry and harsh, the tonic may be combined with a diaphoretic. It sometimes though rarely happens, that coma occurs in this form of the disease. The bowels must then be very freely acted upon by drastic purgatives or stimulating injections, a blister applied to the scalp and cupping glasses to the loins. The patient should be immersed in a hot bath, and sinapisms put upon the epigastrium and extremities.

The treatment of the chronic form has, for the most part, reference to the secondary derangements. Of these, the most common and the most important is anasarca. Diuretics will generally be required, and they should be combined with ferruginous tonics—the acetate of potass and the potasso-tartrate of iron in general answer well—to these may be added tincture of squills, or of digitalis should diuresis not be induced. If diuretics fail, and pulmonary œdema is threatened, we must, without delay, have recourse to hydragogue cathartics,—jalap powder with bitartrate of potass should be given, and elaterium if this should fail. It is often necessary to vary the diuretics:

the nitrate and bitartrate may be tried, with various combinations of squills, ether, digitalis, &c. In cases where there is no dropsy, attention should be directed to the improvement of the general health and the state of the blood: tonics, warm clothing, occasional dry cupping in the lumbar region, a nutritious diet, are the chief of the measures which should be adopted.

Disease of the supra-renal capsules.—The use of the supra-renal capsule is unknown, and until the last few years, we were equally ignorant of its diseases. Dr. Addison, has called attention to a peculiar and fatal cachexia which appears to be related to disease of these structures. The peculiarity consists in the cachexia not being accompanied by marked emaciation. In many instances, the skin is discoloured by dark patches (bronzed), and which were at first thought to be always present. It is now known that they are often absent when the capsules are diseased, and often present when they are healthy. The subject needs further investigation.

DIABETES.—*An excessive flow of Urine.*

The urine is sometimes passed in large quantity from an excess of water, the solid constituents excreted in the twenty-four hours being of the usual amount. This may be temporary, and connected with hysteria or certain mental states. But the quantity may be permanently large, and so large, and the necessity of evacuating it so frequent, that inconvenience and discomfort are occasioned. As many as thirty pints of urine have, it is said, been passed in a single day and night. It need scarcely be said, that the density is always extremely low. The general health is not always affected, but debility and emaciation have been noticed, and the increase of the function of the kidneys may, it is probable, predispose to, if not cause, disease of those organs. The treatment should be tonic, fluid ought to be taken in moderation, and determination to the skin promoted by frictions and exercise in the open air.

Along with copious secretion of urine, urea may be increased or diminished in proportion; but the causes and effects of these conditions of the urine, as distinct from organic disease, are little known.

DIABETES MELLITUS.—*Diabetes.—Excessive secretion of urine containing sugar.*—The secretion of a large quantity of urine of great density, depending upon the presence of sugar (grape sugar or glucose), has long been described under the designation "diabetes." It is common in Great Britain, but is said not to be of frequent occurrence in America,* and it is certainly rare in India. Dr. Morehead only saw six cases,† and about the same number have fallen under my own observation during an experience of twenty years in Bombay.

Symptoms.—The early stage of diabetes is not usually recognised. When first seen, the patient generally complains of having lost flesh, and of being weak and unfit for exertion, —mental or bodily—of much thirst and a sweetish taste in the mouth, and of passing urine in large quantities. The skin is dry and harsh, the mouth clammy, and the tongue covered with a white sticky fur ; the bowels are constipated, and the evacuations dry and scanty. There is complaint of pain in the back and limbs, of constant chilliness, and very generally of dimness of sight. The appetite is good or even inordinate, but digestion is impaired, and emaciation often considerable. Hectic accessions are noticed towards night, and sleep is disturbed or wanting. The urine varies in quantity from 4 or 5 to even 50 pints in twenty-four hours. It is of a pale colour, and has a sweetish smell and taste. But the most noticeable character, considering the large quantity passed, is its specific gravity, which, on the average, is about 1040, but may be as high as 1070, and is seldom below 1030.‡ The increased density of the urine is mainly due to the presence of sugar, which may be ascertained by various tests.§ The quantity of sugar is subject to much variety, there being merely a trace, or

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* Dr. Wood's Practice of Medicine, Vol. II., page 584.

† Researches on Disease in India, page 502, 2nd edition.

‡ Parkes on Urine, page 346. These numbers are too high for the Hindoo and Mussulman population of India. I have not seen diabetic urine of higher specific gravity than 1045.

§ *Moore's Test.*—Boil equal parts of urine and solution of potash in a test tube—a claret colour will be produced if sugar is present. The solution of potash should be first tested for lead.

Trommer's Test.—Add to the urine a drop or two of a solution of sulphate as much as 2½ lbs. passed in twenty-four hours.* In all cases, the quantity of sugar is increased by saccharine and amylaceous food, and in some instances no sugar is formed when this kind of food is not taken.

Progress.—The progress of diabetes is very various. When the sugar appears to be only formed from the starchy and saccharine constituents of the food, the course of the disease is slow, and by regulation of the diet, a tolerable state of health may be maintained for many years. But when, as happens in bad cases, the sugar is readily formed from the albuminoid constituents, emaciation day by day increases, the gums become spongy and separate from the teeth, boils and carbuncles are apt to occur, and tubercular disease of the lung manifests itself. If not carried off by one or other of these affections, the secretion of urine becomes suppressed, and the patient dies exhausted and comatose.

Pathology.—The pathology of diabetes is, I believe, wholly unknown. It need scarcely be said, that the kidney is in no way affected, that organ merely eliminating the sugar which

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of copper, just sufficient to colour it; then add a solution of potash in excess; afterwards gently heat over a spirit lamp. Red oxide of copper will be precipitated if sugar is present.

Yeast test.—If a little yeast be added to urine containing sugar, at a temperature of about 80°, effervescence occurs, and after gas has been given off, a yellowish fluid is left, which has the odour of beer, and yields alcohol on distillation.

* The quantity of sugar may approximately be determined as follows:—Place equal quantities of the urine in separate vessels, note their specific gravities, add to one of them a small piece of German yeast, and at the end of 24 hours again take their specific gravities. The difference in degrees will represent the quantity of sugar; one degree of specific gravity lost, will correspond to one grain of sugar per ounce. The quantity may be more accurately determined by the copper test. The following solution is recommended by Dr. Pavy:—

Sulphate of copper 320 grains.
Tartrate of potass (neutral) 640 grains.
Caustic potash (*potassa fusa*) 1280 grains.
Distilled water 20 fluid ounces.

Dissolve each in a separate portion of the water, then mix the sulphate of copper and tartrate of potash, and afterwards add the alkali. 100 minims of this solution will be exactly decolorized by half a grain of grape sugar.

already exists in the blood. It seems certain, that the liver is capable of forming a substance which is readily converted into sugar, not only from the starchy and saccharine constituents of the food, but also from the albuminoid constituents. We are not aware of all the circumstances under which such conversion takes place. Irritation of certain parts of the nervous centres, has been followed by the presence of sugar in the blood, and so also has the inhalation of certain vapours—the vapour of chloroform for example—and it is quite possible, that the sugar may have resulted from the conversion of the hepatine or glucogene just referred to. How far the sugar-forming power of the liver is concerned in diabetes, has yet to be determined.

Causes.—The causes of diabetes are equally unknown. Those usually assigned—such as drinking cold water, exposure to alternations of temperature, habitual intoxication, &c. are in the highest degree doubtful. That climate, or habits of life, or both combined, have some influence, appears probable from the comparative infrequency of the disease in tropical countries.

Treatment.—The pathology of diabetes is not sufficiently established to render treatment satisfactory. It may be stated at once, that there is no specific for this disease. Of medicines, opium alone has the power of directly diminishing the quantity of urine. The main part of the treatment consists in the regulation of the diet, viz. by withholding those constituents of food which are easily converted into sugar, as the starchy and saccharine. The patient should, as much as possible, be placed on animal diet. There is some difficulty in this country, where vegetables form so large a proportion of the food consumed, in carrying this into effect. To those who abstain from flesh of all kinds, milk may be given, as it appears that its sugar is not readily converted into glucose. Bread prepared from gluten of wheat, or bran bread, as recommended by Dr. Camplin, may be recommended. Vegetables which do not supply materials for forming sugar may be allowed, as cabbage, spinnage, turnip tops, &c., and attempts may be made to diminish the quantity of urine by restricting the quantity of fluid drank, by producing secretion from the skin by opium and ipecacuanha, and warm clothing, or the vapour bath; and by the use of astringents and opium.

To make up for the waste of tissue, and thus lessen emaciation, tonics are usually given.

Chylo-serous urine.—*Discharge of urine of a milky appearance.*—This is comparatively a rare disease. It is more common in tropical than temperate climates, and consists in the passage of urine of the appearance of chyle or milk, but which is sometimes tinged red. On being allowed to stand, it often spontaneously coagulates, and always does so on the application of heat or nitric acid; the coagulability depends upon fibrin and albumen. Not unfrequently blood is present. The opacity or milky appearance is caused by fat molecules, and is most marked after meals; sometimes it disappears for a time without any apparent cause. When examined by the microscope, molecular fatty matter, blood globules, small granular corpuscules, and larger corpuscules resembling the chyle corpuscule, are seen.* By chemical analysis, the urine is found to contain fat, albumen, often fibrin, and sometimes blood. There are no general symptoms which are characteristic of this affection. In the greater number of cases recorded, there has been more or less anæmia, but the health in many instances did not appear to suffer. Little or nothing is known of the pathology of this affection. It has been thought, that a portion of the chyle is not converted into blood, and mixing with the latter fluid, is excreted by the kidneys, but chyle cannot be detected in the blood; others have thought that the kidneys are diseased, but this has not been proved. My colleague, Dr. Carter, who has paid much attention to this subject, believes that there is a direct communication between the lymphatics and lacteals and the kidney. The endemic occurrence of the disease is, however, opposed to this view.

Prognosis.—The prognosis is favourable—the disease generally disappears spontaneously.

Treatment.—The main indication is to remove a cachectic state, should this be present. Tonics, of which the preparations of iron are probably the best, should be given. Change of air seems to be very serviceable.

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* The best microscopic examinations are recorded by my colleague Dr. H. V. Carter.—*Vide* Transactions Bombay Medical and Physical Society, New Series, No. VII., page 171.

ISCHURIA RENALIS.—*Suppression of urine.*—Suppression of, or diminution in, the quantity of urine, is not uncommon in many diseases, and is a frequent cause of death; but sometimes, though very rarely, the urinary secretion suddenly ceases when there is no evidence of organic disease. For a short time there may be little other noticeable derangement, but the patient soon becomes restless and anxious, or has a chill, followed by nausea and vomiting. He afterwards becomes drowsy and incoherent, and has a slow pulse; this state continues for a few hours, and passes into coma, convulsions, and death. The duration of the attack will depend upon the amount of suppression. If no urine is passed, death will usually occur within 48 hours; but if any urine, even a few drops, is passed, life may be prolonged for many days or even weeks. No light has been thrown upon the nature of this affection by post-mortem examinations. The kidneys have been found in various states of congestion, but not so disorganized as would explain the entire suspension of their function. The influence which innervation exercises on secretion, points to the nervous system as perhaps primarily the seat of the derangement—the coma rapidly ending in death, is without doubt caused by the solid constituents of the urine accumulating in the blood.

Treatment.—Attempts may be made to eliminate the noxious matters by purgatives and sudorifics, as the warm bath, &c. at the same time we may endeavour to restore the function of the kidney, by cupping the loins, and the cautious use of diuretics.

HÆMATURIA.—*Hæmorrahge from the Urinary Organs.*

Blood is not unfrequently passed with the urine. Its presence may be suspected when the urine is of a red or dark-brown colour, and especially if it should deposit a reddish-looking sediment. Should albumen be detected, little doubt would remain, and none whatever if blood globules were seen under the microscope. The red or dark colour alone would not be a sufficient guide, as this might be produced in other ways.

It is always desirable to ascertain, if possible, the part of the urinary apparatus from which the blood is derived. If before or at the time of passing urine pain is felt in the lumbar region, and the blood is mixed intimately with the urine, it probably comes from the kidney. This would be made quite certain if there were casts of the uriniferous tubes; and if these contained spheroidal epithelial cells, the cortical part of the kidney might be assigned as the seat of the hæmorrhage. If the blood comes away towards the end of or after micturition, it proceeds from the bladder; and if discharged separately from the urine, from the urethra. In by far the greater number of cases, hæmaturia is dependent upon an altered condition of the blood itself, calcareous formations, or organic disease, or injury of some part of the urinary apparatus. Dr. Watson* mentions a case in which the bleeding seemed to arise from simple determination of blood to the surface of the urethra, and Dr. Basham has seen several cases where it was traced to mental excitement.†

Treatment.—The treatment of hæmaturia will be, for the most part, the treatment of the disease upon which it depends; sometimes, however, the bleeding is so considerable, that special measures to check it are called for: the patient should be kept quiet, cold applications used to the region of the pelvis, and cold water or an astringent lotion injected into the bladder, when the seat of the hæmorrhage is in that organ. Astringent medicines may be administered by the mouth; of these the acetate of lead and gallic acid are the best.

Cancer of the kidney.—Malignant disease of the kidney is occasionally met with, but much less frequently than of the liver or stomach. The symptoms are those of chronic nephritis, from which it could not be distinguished during life.

CYSTITIS.—*Inflammation of the Bladder.*

Although inflammation of the bladder may occur as a primary or idiopathic disease, it is more frequently secondary upon other affections, or caused by external injury.

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* Lectures on the Practice of Physic, Vol. II., page 611.

† Lancet, 1857, Vol. 11, page 107.

Cystitis sets in with fever and pain of the hypogastrium. The pain is increased by pressure, and often extends along the urethra to the glans penis, to the perineum and anus, and even to the insides of the thighs. When the disease is established, there is frequent and painful micturition, febrile disturbance, nausea, and much depression; the pulse is small, frequent, and easily compressible, and the face pinched and anxious. As the disease advances, the pain becomes more severe, and the prostration greater. The urine is passed more frequently, and often by drops; fulness is felt above the pubes, and the whole of the abdomen is sometimes tympanitic and tender. At length the pulse becomes very small, feeble, and irregular, the tongue dry, and the skin clammy. Low muttering delirium sets in, and sometimes coma and convulsions, from which the patient dies in from 8 to 10 days.

In very favourable cases, the inflammation may terminate by resolution ; in others more severe, suppuration may take place, and the patient yet recover. Occasionally, abscesses form in the coats of the bladder, and open into the rectum or vagina, forming fistulæ, and causing death by exhaustion after months or years. In fatal cases, the usual appearances of inflammation of a mucous membrane are seen, viz. redness, softening, ulceration, and even gangrene. Abscesses are sometimes found in the walls of the bladder, and the coats infiltrated with serum or pus. Cystitis is produced by mechanical causes,—foreign bodies—calculi, &c. the passage of cathethers, distension from urine, &c. It also results from injury, and not unfrequently inflammation extends from the urethra. Exposure to cold is assigned as a cause, and, with less probability, the suppression of habitual discharges or of cutaneous diseases.

Treatment.—The treatment does not differ from that of inflammation of other mucous membranes. Leeches to the hypogastrium, fomentations, opium either by the mouth or in enemata, are the remedies which are chiefly employed. The patient should drink freely of diluents. Diaphoretics are often useful.

SECTION II.

DISEASES OF THE CHEST.

The chest, conical in shape, is narrower above than below, and flattened from before backwards. It is bounded *in front*, *behind*, and on *each side*, by the osseous and cartilaginous frame-work of the trunk, and the muscles and other soft parts in connection with it; and *below* by the diaphragm, which forms a floor, oblique from before backwards—thus rendering the posterior deeper than the anterior part of the cavity. *Above* the chest is open, and gives exit to the large arteries, and entrance to the trachea, œsophagus, nerves and large veins. The apex of the lung on each side reaches through this aperture for a short distance above the clavicles.

Physical examination of the chest.—It is usual to map out the surface of the chest into spaces or regions; but in describing physical signs, it is a better plan, when possible, to relate them to known points on the chest—as, for example, so many inches above or below, to the right or left of the nipple, or below or above the clavicle, &c. The following simple arrangement of regions may be adopted. Two perpendicular lines—one drawn *in front* from the acromial angle, the other *behind* from the posterior fold of the axilla—will divide the chest into anterior, lateral, and posterior portions. These may be subdivided into clavicular, mammary, sternal, axillary, and scapular regions.

Clavicular region.—The clavicular regions are bounded *above* by a line drawn from the outer part of the clavicle to the trachea; *below*, by the lower border of the third rib; *internally*, by the edge of the sternum; and *externally*, by the perpendicular line which separates the anterior from the lateral regions. That part above the clavicle is named supra-clavicular, that below it infra-clavicular; whilst the intervening portion, which corresponds to the inner half of the clavicle, is the middle or clavicular region.

Mammary regions.—The mammary regions comprise the remainder of the anterior part of the chest, with the exception of the sternal region—being bounded *above* by the lower border of the third rib, *below* by a curved line corresponding to the edges of the false ribs. The portion which is between the third and sixth ribs is named *mammary,* that below the latter point *infra-mammary.*

Sternal regions.—The sternal regions—*supra, upper,* and *lower,*—correspond to the space above the notch, and to the sternum above and below the third rib.

Axillary region.—The axillary regions extend from the apex of the axilla to the edge of the false ribs. *In front* they are bounded by the infra-clavicular, mammary, and infra-mammary regions; *behind* by the perpendicular line separating the lateral from the dorsal regions. The portion above the sixth rib is the axillary; that below it the infra-axillary region.

Scapular regions.—The scapular regions correspond to the situation of the scapulæ, and to the spaces below and between them. The upper and lower scapular regions are limited by the supra and infra-spinal fossa; the intra-scapular is between the scapular and the spine; the infra-scapular extends from the lower angle of the scapula to the twelfth rib, being bounded *in front* by the line marking the separation between the lateral and dorsal regions, and *behind* by the vertebral column.

The chest is examined by inspection, palpation, measurement, percussion, and auscultation.

Inspection.—In health, the two sides of the chest are symmetrical, the supra-clavicular spaces slightly depressed, and the infra-clavicular somewhat convex. The intercostal spaces are plainly seen, and the nipples are on the same level (over the 4th rib or 4th intercostal space).

The visible changes caused by disease are in shape and size.

The whole of one or both sides of the chest may be unusually prominent (*expansion*), or the prominence may be circumscribed (*bulging*). Expansion and bulging are mostly due to fluid in the sac of the pleura, or emphysema of the lungs; but the latter is also caused by enlargement of the liver or spleen, tumors, &c.

The opposite of expansion and bulging are *retraction* and *depression*, which are produced by everything which reduces the size of the lung or prevents its distension—as the pressure of fluid, tubercular and other deposits, atrophy, &c.

The chest is sometimes distorted—one side being lower than the other (procidentia); or, the spine being curved, its ordinary shape may be almost entirely lost. These changes are sometimes seen in pleurisy after the fluid has been absorbed, the lung being so bound down to the posterior wall, as to be unable to expand.

During inspiration the chest expands and is elevated; these movements are plainly to be seen. They may be diminished voluntarily or instinctively to avoid pain, or by paralysis of the muscles; and they are always lessened by anything which interferes with the entrance of air into the lung—as spasm of the tubes, inflammatory exudations into the air cells, &c. If there should be obstruction to the entrance of air high up in the passages—as in the larynx or throat—the chest *retracts* in place of *expanding* during inspiration.

The relation between the movements of the chest and abdomen during respiration are liable to be disturbed. In abdominal diseases the chest chiefly moves; in thoracic diseases the abdomen—hence *thoracic* and *abdominal* breathing.

Lastly, the rhythm is sometimes changed, the expiratory part of the respiratory act being as long or even longer than the inspiratory.

Manual examination or palpation.—By placing the hand upon the chest, irregularities and partial changes of shape may be recognised, and local expansive movement determined; and when the patient speaks, a vibratile tremor is felt—*vocal fremitus* or *thrill.* The vocal *fremitus* is not felt if forcible pressure is made; it is strong in proportion to the graveness of the voice, and is therefore more marked in males than in females, and in adults than in children. It is also more distinct on the right than on the left side of the chest, except the lower part, where the liver interferes with the vibrations.

The vocal *fremitus* is exaggerated when the lung is consolidated; but it is destroyed when the organ is removed from the wall of the chest—as by effusions.

Measuring the chest.—Very valuable information is sometimes obtained by measuring the chest, so as to ascertain whether or not there is any difference of size in the two sides. Measurement is also sometimes useful as a means of determining the amount of expansion and retraction of the whole or a part of the chest during inspiration and expiration.

The right side of the chest usually measures about half an inch more than the left. When comparing the two sides, care must be taken that the tape is placed over corresponding points, and drawn with the same degree of tightness.

Instruments have been invented for the purpose of measuring the chest whilst in motion, so as to determine, by the greater or less degree of expansibility, the comparative quantity of air which may enter the lung, or a part of the lung, and thus to permit of an inference being drawn as to the permeability of the organ. Not having myself used these instruments, I must refer the student to the works in which they are described.*

PERCUSSION.—Percussion consists in striking the wall of the chest, either with the fingers or an instrument, in such a way, as to elicit a sound, the object being to determine the density of the organs within. Two or more, or all the fingers of the right hand are usually employed as the percussor, the index and middle fingers of the left hand being placed upon the chest to receive the blow. But sometimes a sort of hammer is used to percuss with, and a flat substance is placed upon the chest. Percussion may be either immediate or mediate; that is, the chest may be at once struck, or something may be interposed between it and the percussor. Mediate has so many advantages, that immediate percussion is now scarcely ever employed. The substance placed on the chest in mediate percussion, is called a *pleximeter*. Many pleximeters have been invented, but it is probable that the first two fingers of the left hand form, under all circumstances, the best, when the fingers of the other hand are used to percuss with. They must be placed with their palmar surfaces in accurate contact with the chest, in order that air may be excluded. The percussing fingers should have their points upon exactly the same level, and the thumb should be firmly pressed against the outer side of the index finger. When the percussion is to be light—as in children—one finger only need be used.

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* Walshe on Disease of the Lungs and Heart. Davies on Disease of the Lungs and Heart.

The percussion stroke should be sharp and sudden, the points of the fingers being brought perpendicularly upon the pleximeter, and immediately raised; and the movement in percussing should be from the wrist, and never from the elbow. The patient should be in the sitting posture. When the anterior part of the chest is being percussed, the arms should hang down loosely by the sides; when the lateral part, they may be raised above the head; and when the posterior, folded over the chest.

When the two sides of the chest are to be compared by percussion, it is essential that the pleximeter should be applied exactly in the same way to corresponding spots on each side, and the force of the percussion should be precisely the same.

The sound elicited by percussing the healthy chest, is not the same in every part of it. In the infra-clavicular regions it is clear and resonant; in the mammary regions, it is, on firm percussion, deadened by the liver and heart; whilst in the infra-mammary regions, the sound is almost dull from the presence of those organs and the spleen. Percussion over the inner end of the clavicle, elicits a clear sound which is in some degree tubular from the trachea. Towards the outer end, there is little resonance. The supra-clavicular region is quite resonant. The resonance in the supra-sternal region is tubular; in the sternal it is sometimes dull from the presence of fat, at other times it resembles that over the inner end of the clavicle. The sound in the lower sternal region is complex, owing to the presence of the heart, liver, diaphragm, and not unfrequently a distended stomach. The scapular regions do not in general give a clear sound, though in thin persons a good deal of resonance may be elicited. Below the scapulæ, on gentle percussion, the whole of the back part of the chest is resonant, as far as the eleventh intercostal space; but firm percussion on the right side elicits the dulness of the liver from about the eighth or ninth rib, and on the left, that of the spleen from about the tenth rib.

The axillary region is very resonant, particularly at the upper part. The right infra-axillary region is dull, on forcible percussion, from the liver. On the left side, the pulmonary resonance is modified by the presence of the spleen and stomach. It should be noticed, that the resistance of the thoracic wall on percussion varies, being but little when the percussion is clear, and considerable when it is dull.

The percussion note is more clear, and the resistance less, during a full inspiration, and less clear, and the resistance greater, during a full expiration. When comparing the two sides, it is in some cases desirable to make the patient hold his breath, so that the percussion on each side may be made when both lungs are in the same state as regards respiration. The clearness of the percussion sound is not the same in all persons or at all ages: in fat persons it is not so clear as in those who are thin, and it is clearer in young than in old people. Moreover, there are differences in this respect which cannot be explained.

Diminished resonance.—The most common change of the ordinary sound, is a decrease of clearness, which may be comparatively slight, or so great, that no resonance can be perceived. The loss of resonance may be caused by—(*a*) anything which, being of greater density, occupies the place of a portion, or the whole of the lung, and its contained air; (*b*) derangements which, whilst favouring expiration, interfere with the admission of air, and thus empty a portion of the lung.

Increased resonance.—The resonance is increased, and the resistance diminished, whenever there is more than the usual quantity of air in the cells. When air is contained in a cavity in the lung, the resonance is increased, *as well as the resistance.*

Alteration of character.—When the percussion sound resembles that which is produced by percussing the trachea, it is called tubular. Tubular percussion is noticed in certain parts of the chest, when the larger bronchi are brought near the surface by pleuritic effusion, and whenever the lung is solidified, or a solid substance lies over the larger bronchial tubes. From the situation of these tubes, it will be easily understood that tubular percussion is most marked in the infra-clavicular and infra-scapular regions; but when the solidification is extensive, it may be heard over a great part of the chest.

Amphoric percussion.—The amphoric percussion sound resembles that "produced by filliping the cheek when the mouth is closed and fully, but not too tensely, inflated." It is heard when there is a cavity of large size in the lung, near the surface, the walls of which are thin and hard; also, sometimes in pleuro-pneumonia and in distension of the stomach.

Cracked-pot sound.—The cracked pot sound is similiar to that caused by striking a broken metallic vessel. It may be imitated by folding the hands loosely together, and then striking the back of one hand against the knee, whereby the air from between the hands is forced out through the fingers. It is usually heard over a large cavity in the lung, which has a free communication with a bronchial tube, and is supposed to be produced by the sudden expulsion of air from the cavity, "against the walls of the passages with which it comes into contact." This sound is sometimes heard in children suffering from bronchitis, and along with the tubular percussion of pneumonia.

Tympanitic sound.—The tympanitic sound resembles the sound of a drum when struck, hence its name. It is present when the pleura is filled with air and in distension of the stomach.

AUSCULTATION.—By auscultation or listening, certain sounds are heard upon the surface of the chest, which are produced by the action of the lungs and heart, during the performance of their functions.

Auscultation, like percussion, may be either *immediate* or *mediate*; that is, the ear may be placed directly upon the chest, or an instrument capable of conducting sound, called a "stethoscope," may be used. Immediate auscultation is well adapted to the back part of the chest, but in examining the front part, mediate auscultation is preferable.

Respiratory or vesicular murmur.—In a healthy person, who is breathing naturally, a faint rustling sound is heard over every part of the chest during respiration. This is the *respiratory* or *vesicular murmur.* It has been compared to the rustling or waving of the leaves of a tree when agitated by a gentle breeze, and is usually heard both during inspiration and expiration, but the expiratory part of the sound is much shorter than the inspiratory, and in some persons is altogether inaudible. The respiratory murmur is caused by the passage of air into and out of the air cells.

Bronchial respiration.—On each side of the first bone of the sternum, and between the scapula and vertebral column, a much more harsh sound may be distinguished. It is of a somewhat blowing character, and the expiratory portion is as long, if not longer, than the inspiratory portion. It is caused by air passing along the larger bronchial tubes, and hence named "bronchial breathing." In health it is only heard in the situations just mentioned, viz. over the primary divisions of the bronchi; but in certain diseases it can be detected in other parts of the chest. A somewhat similar sound, more intensified, and of a more whiffing character, is audible when the stethoscope is placed upon the trachea.

Vocal resonance.—If the ear is applied to the chest, and the patient made to speak, a diffused rumbling sound is heard. This is produced by the vibration of air through the divisions and ramifications of the bronchial tubes. Near the first bone of the sternum, and in the interscapular region, the sound is more concentrated, and if the stethoscope should be placed over the trachea, whilst the patient is speaking, the voice is so harsh and loud, as sometimes to make the ear painful. The vocal resonance is most intense when the voice is grave, and therefore better marked in men than women. It is intensified in old age, and is then often tremulous and bleating; on the right side, chiefly beneath the clavicles and between the spines of the scapular and the median line, it is rather more developed than on the opposite side.

CHANGES DETECTED BY AUSCULTATION IN PULMONARY DISEASE.

The sounds heard in disease of the lungs are—1, some change in the duration, intensity, and character of the respiratory murmur; 2, modified bronchial breathing and vocal resonance; 3, abnormal or adventitious sounds.

Exaggerated or puerile respiration.—The respiratory murmur is sometimes louder and more distinct than usual, but without any change in its character or quality. This is exaggerated or puerile respiration. It depends upon undue activity of the part of the lung over which it is heard, more air passing in and out, and with more force than usual. Exaggerated respiration usually indicates impediment to the admission of air into some other part of the lung, in consequence of which, more than the usual quantity enters the remaining portion. It is therefore noticed in healthy lung, when other parts are consolidated, as in pneumonia, tubercular and cancerous disease, pulmonary apoplexy and collapse, &c. It is also heard when spasm of the bronchial tubes has been suddenly removed —as in spasmodic asthma. In children, the ordinary respiration is exaggerated, as compared with adults,—hence the term "puerile," used to designate exaggerated respiration in the latter.

Although exaggerated respiration does not indicate disease in that portion of the lung where it is heard, yet it is strong presumptive evidence of the existence of disease in some other part.

Weak and suppressed respiration.—The respiration may be less distinct than usual, or altogether absent. This happens whenever less than the usual quantity, or no air at all, enters the pulmonary tissue. Air may be impeded, or prevented from entering by obstruction in the air passages, or by the air cells being filled or obliterated by solid deposits; also by effusions into the pleural sac—complete suppression of the respiratory sound is usually caused by pleuritic effusions. Although the air cells may be filled with air, yet if it is not in motion, as in emphysema, the respiratory sounds will be indistinct or inaudible.

Change in the relative length of the inspiratory and expiratory part of the vesicular murmur.—In health, the inspiratory part of the vesiclar murmur, as regards intensity and duration, bears the relation to the expiratory part of 3 to 1. This may be so modified by disease, that the latter may be as long or even longer, and more distinct than the former. The prolongation and intensification of the expiratory sound, seem to be caused by anything which interferes with the passage of air outwards from the lungs. It may be expected to be present, therefore, when tubercle is deposited upon the inner surface of the air cells and minute bronchial tubes. But diminished elasticity of the lung will also produce it, and it is thus heard in emphysema, and sometimes in pleuritis and pneumo-thorax.

Harsh respiration.—The vesicular murmur sometimes loses its soft rustling character, and sounds harsh and blowing, the expiratory part being loud and prolonged; this is *harsh* respiration. In its most intense degree it passes into *bronchial* respiration, in which the sound is still more blowing, and both murmurs still more rough and hard, and the expiratory even longer and louder than the inspiratory part. Harsh and bronchial respiration are heard in states of incipient consolidation, or in compression of the lung by a small quantity of fluid in the sac of the pleura.

Modified bronchial respiration.—As before mentioned, in certain situations, as over the large bronchial tubes, a more or less blowing sound can be heard in the healthy lung. In some diseased conditions, blowing respiration may be heard in other situations, no doubt because a solid lung conducts the sound of air passing through the bronchial tubes to the walls of the chest. In some instances its blowing character is much intensified, both sounds are rough and hard, and have even a metallic character.

Tubular breathing.—The blowing respiration is sometimes only heard over a limited space, the metallic sound being well marked. The sound has been likened to that produced by blowing through a brass tube. This is *tubular breathing.* It is heard in hepatization of the lung, and less distinctly in consolidation from other causes.

Cavernous respiration.—Cavernous respiration is that in which the sensation is given to the ear of air passing into and out of a cavity of moderate size. It is met with when the bronchial tubes are dilated, or when there are cavities in the lung not containing much fluid.

Amphoric respiration.—When the air appears to pass into a cavity of large size with dense unyielding walls, producing a sound not unlike that caused by blowing into a bottle, the respiration is said to be *amphoric*. It has a very decided metallic ring, and is heard under much the same circumstances as cavernous respiration, the cavity generally being of larger size, and having more unyielding walls; but it is more common when there is communication between the sac of the pleura and the bronchial tubes.

Modification of the vocal resonance.—The vocal resonance is diminished or suspended when fluid or air is present in the sac of the pleura, also when the lung is so much solidified that air does not pass along the smaller bronchial tubes. It is increased (broncophony) when the lung is consolidated around bronchial tubes which are pervious; and when the bronchial tubes are enlarged and hypertrophied. The explanation of broncophony, as usually given, is that the consolidated lung being a better conductor of sound than the healthy spongy lung, the vibrations of the air in the bronchial tubes are more readily conveyed to the surface of the chest.*

Pectoriloquy.—Sometimes the resonance is so intensified, that the sound seems to pass along the stethoscope into the ear of the observer; this has been called "pectoriloquy." It does not indicate any special condition of the lung distinct from consolidation, and is, indeed, nothing more than exaggerated broncophony.

Ægophony.—In another variety of broncophony, the sound, when the patient speaks, is tremulous, and has been compared to the bleating of a goat—this is ægophony. Ægophony is usually heard in a circumscribed spot, when the lung is compressed by a thin layer of fluid.

ABNORMAL OR ADVENTITIOUS SOUNDS.

The sounds hitherto described are modifications of normal or healthy sounds, but others are heard in the chest, in many pulmonary diseases, which are new or adventitious, and which sometimes take the place of the healthy sounds. They are usually designated rhonci, *râles*, or rattles—the first term will be used. Rhonci are produced in the air passages, in the air cells, or in excavations or cavities in the substance of the lung.

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* I have not thought it expedient to notice Skoda's views, nor the explanation given by Dr. Walshe.

Sibilant and sonorous rhonci.—When the bronchial tubes are narrowed by thickening of the coats, by spasm, or what is more frequent, by inspissated mucus adhering to their inner surface, sounds are heard, which are either whistling or snoring in character, and named sibilant and sonorous rhonci. The sibilant rhoncus is heard when the smaller, the sonorous when the larger tubes are affected, but sometimes the large bronchial tubes may be so narrowed, as to resemble small ones, and then the sibilant rhoncus is heard in them.

Crepitant rhoncus.—The crepitant rhoncus is a minute, dry, crackling sound heard during inspiration, and which has been compared to the sound produced by rubbing firmly and slowly between the finger and thumb a lock of hair near the ear. It is seldom heard during expiration, and at first only at the latter part of inspiration. It is produced in the air cells, but the exact manner of its production has not yet been determined. It is generally said to be caused by the passage of air through liquid in the air cells. Crepitant rhoncus is only heard during the early stage of pneumonia.

Crepitus redux.—A modification of the crepitant rhoncus is sometimes heard in a lung which, having been consolidated, is becoming pervious to air. It is larger than the true crepitus, and is heard both during inspiration and expiration.

Sub-crepitant rhoncus.—The sub-crepitant rhoncus gives the idea of the bursting of small bubbles of air in a fluid. The sound is not so small as the crepitant rhoncus, and accompanies both respiratory sounds. It is produced by the bubbling of air through liquid in the small bronchial tubes.

Mucous rhoncus.—The mucous rhoncus resembles the sub-crepitant, only that the bubbles are of large size. It is caused by the bubbling of air through liquid in bronchial tubes of moderate dimensions.

Cavernous rhoncus, or gurgling.—The cavernous rhoncus consists of bubbles of large size, heard both during expiration and inspiration, and having a metallic ring. It is caused by the passage of air into and out of a space or excavation.

Friction sounds.—When the surfaces of the pleuræ have become rough by disease, a sound is produced as they move over one another during respiration. This is called a "friction sound." It may vary in intensity from a sound which is barely audible, to one that is very loud. It may be heard during inspiration or expiration, or with both, and may present the characters of grazing, rubbing, or creaking, &c.

CHAPTER I.

DISEASES OF THE PLEURA AND LUNGS.

PLEURITIS.—PLEURISY; INFLAMMATION OF THE PLEURA.—*Acute, chronic, general, partial, primary, secondary.*

Inflammation is more common in the pleura than in any other tissue or organ; its effects (adhesions) being found after death in the greater number of persons. It may be *general* or *partial*, associated with disease of the lung, or secondary upon that of other organs, as of the kidney or heart. In most cases it affects one only, and most frequently the right side of the chest; but occasionally both pleuræ are involved.

Anatomical characters.—In the early stage the pleura is reddened in dots, points, or streaks, and its brilliancy is lost. The surface is covered with a layer of lymph, which, in sthenic persons, resembles thick cream, but in asthenic persons is more serous and less plastic. Serous fluid, clear or turbid, accumulates in the sac. In the progress of the disease, exudation becomes more abundant, and undergoes various changes: thus, it may be completely organized into delicate areolar tissue by which the surfaces adhere, or, the organization being less perfect, it separates as flakes or films which float in the fluid and render it turbid. Lastly, being insusceptible of organization, it is converted into pus. In asthenic persons, the lymph is caco-plastic, accumulates in successive layers of considerable thickness, and becomes coarse fibrous, or fibro-cartilaginous tissue, into which calcareous matter may be deposited. When the quantity of fluid is small, the parietal and visceral layers are in contact; but as it increases they are separated. The lung being compressed, diminishes in size, and increases in density till it comes to resemble a piece of flesh, hence the term "carnification." It is often not larger than the palm of the hand, and firmly bound by adhesions to the posterior wall of the chest, near the vertebral column. As the fluid still further accumulates, neighbouring organs are displaced: the heart is pushed beyond the nipple on the left side, or from the left to the right side, and the liver made to descend much below the margins of the ribs.

Adhesions and effusion.—Pleuritic adhesions are very common. Sometimes a few delicate bands of considerable length are alone seen; at others the two surfaces are closely and uniformly adherent; and between these extremes, every degree of adhesion may be witnessed. The quantity of fluid may vary from a few ounces to many pints—as many as twelve pints have been measured. It may be clear, more or less turbid, or completely puriform, and flakes of imperfectly organized lymph are often seen floating in it. The fluid either occupies the general sac of the pleura, or is contained in a cyst, formed by organized lymph.

ACUTE PLEURITIS.—*Symptoms.*—The prominent symptoms of acute pleuritis are stabbing pain in the chest, increased by pressure and deep inspiration, a short dry cough, and well-marked febrile disturbance. The pain often occurs suddenly, and either precedes, follows, or sets in simultaneously with the fever, which does not differ from ordinary inflammatory or sympathetic fever. The pain varies much in severity, being but little felt when the pleura near the apex of the lung is alone affected, but very severe when that at the middle or lower part of the chest, or upon the convex surface of the diaphragm is involved. Pressure usually increases it, and then the decubitus is easiest on the opposite side; but should there be no tenderness, the patient prefers to lie on the affected side, so as to restrain as much as possible the movements of the ribs. It is always aggravated by a deep inspiration, and to prevent this, the breathing is short, catching, and abdominal, and being short, is necessarily hurried. As regards situation, the pain is said to be most frequently felt near the nipple, but I have more often known it to extend over the whole of the affected side. A short dry cough is a common and early symptom; if there be expectoration, intercurrent bronchitis is generally present. The pulse is often full, but if the pain is very severe, it becomes small. The face is anxious and somewhat pinched in expression, and the alæ nasi are often observed in action. Should the inflammation attack the pleura over the diaphragm, the pain is felt beneath the margins of the ribs, or at the scrobiculus cordis, and is increased by pressure upwards, and the breathing is short and thoracic. There is sometimes vomiting, and very often a short dry cough. There may be at first no physical signs, and when the disease is on the right side, it may be difficult to distinguish the pleuritis from hepatitis: rapidly increasing dulness from effusion will throw light upon the nature of the attack.

Progress.—As the disease advances, the febrile heat and pain in some degree subside, but the face is more pinched and anxious, and the breathing oppressed; dyspnœa, indeed, becomes a very prominent symptom, from the pressure of the fluid upon the lung. Its severity, however, will depend upon the rapidity with which the effusion has taken place. The decubitus is painful on the sound side, from the pressure of the fluid on the lung of that side. The heart is often displaced, being pushed to the left of the nipple if the effusion is on the right, and from its usual situation to the right of the median line if on the left side.

The fluid may after a time be removed by absorption, with or without retraction of the chest; or continuing to increase, it may exert such pressure on the lungs and heart, as to cause death by asphyxia and syncope. Lastly, it is sometimes converted into pus (empyema). If the fluid is not in large quantity, and has been recently effused—the lung not being bound by adhesions to the posterior wall of the chest—respiration is fully re-established on its removal, and the chest resumes its natural size and shape. In less favourable cases, after the fluid is removed, the chest becomes flattened, owing to the lung being unable to expand. This arises in part from the contraction of the exudation, which causes pressure upon the lung, but mainly on account of the adhesions by which it is bound to the posterior wall.

Physical signs.—Three periods or stages are recognised by physical signs, viz. the stages of exudation, effusion, and absorption.

1. *Exudation.*—The movements of the affected side are diminished, the respiratory murmur is feeble, and accompanied by a rubbing or grazing friction sound.

2. *Effusion.*—The quantity of the effusion may be such as to fill the chest entirely or in part only, and these conditions require separate consideration.

The chest partially filled.—There is absence of movement in, and bulging of, the lower part of the affected side. The intercostal spaces are less hollow than on the opposite side. Breath sounds, the vocal *fremitus* and resonance are wanting, but ægophony is sometimes heard near the lower angle of the scapula. The percussion note is completely dull. The upper surface of the fluid may be clearly defined; above this, respiration is exaggerated and sometimes blowing, and a friction sound may often be heard. The dulness on percussion varies by change of posture: in the sitting posture the upper part of the chest is resonant, all the regions below a certain level being dull; when the patient lies on the sound side, the lateral, and when on the face, the dorsal regions, are resonant. It must however be remembered, that when the fluid is encysted, as not unfrequently happens, the resonance does not vary its position.

The chest completely filled.—There is now no variation in the situation of the dulness: it is general and complete—and as the fluid, by its accumulation, pushes the membrane before it in every direction, it even extends beyond the usual limits of the affected side, and may be noticed across the mediastinum in the opposite side of the chest and above the clavicle. The whole side of the chest is enlarged and immovable; the intercostal spaces are effaced, or even bulge outwards. No breath sounds are audible, except at the apex of the lung, or close to the vertebral column, and the vocal *fremitus* and resonance are most marked on the healthy side. The heart is displaced, and the liver or spleen forced downwards.

3. *Absorption.*—In favourable cases, as the fluid is absorbed and the lung expands, bulging and enlargement disappear; the vocal *fremitus* returns, the percussion note becomes clear, and the respiratory murmur is gradually restored. Friction sound often reappears and remains for a longer or shorter time.

In less favourable cases the lung does not expand, and consequently the chest is flattened or retracted. The retraction may be general, but is more frequently partial, and it may be increased by the contraction of the exudation after the fluid has been absorbed.

CHRONIC PLEURITIS.—When the effusion remains for a considerable time without being removed, chronic pleuritis is said to be present, or the attack may be chronic from the first. The symptoms are then uneasiness, scarcely amounting to pain of the affected side, dry cough, difficulty of breathing, and a tendency on the part of the patient to become anæmic and emaciated.

EMPYEMA.—Not unfrequently the fluid, in place of being serous, is puriform. This is *empyema.* It may be the result of acute inflammation, occurring within the first few days of the attack, but more frequently, the ordinary serous effusion becomes puriform at a later period.

There may be difficulty in ascertaining the nature of the effusion; but if it has resisted the usual means of bringing about absorption, has continued for many days without change, and hectic fever is present, little doubt need be entertained of its puriform nature. The rapid transformation of serous fluid into pus is often due to air in the pleural sac. Not only in such cases is the respiratory murmur absent, but, in the sitting posture above a given point, the percussion note will be tympanitic, amphoric, or metallic, and amphoric breathing will sometimes be heard. But perhaps the most characteristic sign is the splashing sound, heard on listening to the chest whilst the body is shaken. The course of empyema is not always the same: in some cases the patient becomes daily more exhausted, and sinks from asthenia; in others he dies even more quickly from the pressure of the fluid upon the lung. Now and then the pus seeks an outlet for its discharge—thus, it may reach the surface of some part of the thorax at an intercostal space, or, as I have twice seen, by making its way through the sternum; at other times it bursts into the bronchial tubes.

PNEUMO-THORAX.—The admission of air into the pleura gives rise to pneumo-thorax, but inasmuch as it almost invariably excites inflammation and suppuration, pneumo-thorax cannot, in most cases, be disconnected from empyema; still there are special symptoms which should be known, and which are due to the sudden admission of air between the surfaces of the pleura. At the moment of entrance, intense stabbing pain is felt in some part of the chest, followed by much collapse and depression of the heart's action. The patient may at once be carried off by syncope; but usually, after a longer or shorter interval, reaction comes on, accompanied by symptoms of acute pleuritis, and rapidly increasing effusion. The effects, however, will in some degree depend upon the kind of opening through which the air has passed: should it be valvular, air will enter but cannot escape—hence the chest will become filled and distended, the air pressing not only upon one lung, but through the mediastinum, upon the lung of the opposite side, causing speedy death by apnœa. The physical signs of pneumo-thorax are very characteristic: the percussion is tympanitic, with absence of respiratory sound. In most cases, however, they are mixed up with the physical signs of empyema.

Air may enter the cavity of the pleura through a wound in the wall of the chest, or by the bursting of a vomica or abscess in the lung. The rupture of one or more air cells in emphysema has led to it, as has also a wound of the lung by the end of a fractured rib. Air or gas is sometimes found in the pleura, without any communication with the atmosphere; it is then supposed to be the result of decomposition of the liquids or of the pulmonary tissue.

Causes of pleuritis.—Besides the ordinary causes of inflammation, as for example exposure to cold, injury, and the like, pleuritis may be produced by the irration of tubercle in the lung; in such cases, however, it is nearly always partial, and limited to the neighbourhood of the tubercular deposit. General pleuritis, associated with phthisis is certainly rare. Pleuritis, as a secondary disease, is common in renal affections, and occasional in connection with rheumatism. It frequently exists in association with pneumonia, but, as in phthisis, is generally limited by the extent of the pulmonary disease. Empyema is often produced by the bursting of an abscess, as of the lung (vomica), or of the liver.

Diagnosis.—The early stage of pleuritis may be distinguished from pleurodynia, by the friction sounds and fever; and from pneumonia, by the severity and character of the pain, and want of the charateristic expectoration, but mainly by the difference in physical signs.*

Between pleuritis with effusion and hepatic abscess there is occasionally much resemblance. The history, character of the pain, and mode of commencement of the attack, will often throw light upon its nature. But in the absence of such information, the diagnosis will be difficult, and the difficulty will be increased should there be, as often happens, circumscribed empyema along with hepatic abscess. In such cases, a certain diagnosis cannot, I believe, always be formed.

The distinctions between pleuritis and pneumonia will be stated under the latter disease.

Prognosis.—The prognosis is favourable in the early stage of acute pleuritis. After effusion has taken place, it will depend upon the quantity and nature of the effusion,—a large collection of serum may exert such pressure on one or both lungs, as to cause death by apnœa.

Treatment.—The treatment must be modified according to the stage of the inflammation and the patient's constitution. In sthenic persons, during the first two or three days of the attack, the patient may be bled to fifteen or twenty ounces, or until the pulse becomes soft, and the bleeding followed by a sedative dose of tincture of opium, or what is better, by a pill of ten grains of calomel and two of opium. Should the pain return at the end of four or five hours, the bowels should be freely acted upon by a brisk cathartic and leeches applied. After the action of the purgative, two grains of calomel, one quarter of a grain of antimony, and the same quantity of opium, may be administered every three or four hours, and continued until the gums become tender, should the inflammation not be previously removed. After the more acute symptoms have subsided, and there are signs of effusion, a blister is to be applied to the affected side of the chest.

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* In diaphragmatic pleuritis, the symptoms closely resemble those of hepatitis. The physical signs of rapidly increasing effusion will often determine the nature of the case.

In asthenic persons, or where the attack has lasted for several days, local is preferable to general bleeding. Mercury may be cautiously given; but if the patient is very asthenic, it should be withheld, and iodide of potassium or diuretics substituted.

Treatment of chronic pleuritis.—All possible means should be adopted to cause absorption: mercurials, the preparations of iodine, counter-irritants, tonics, diuretics, repeated blistering, iodine, and rubefacients are to be had recourse to. Should these fail, and the fluid increase so much, as by its pressure to interfere with the functions of respiration and circulation to such an extent as to endanger life, the operation of paracentesis is to be performed, and a portion of the fluid withdrawn, and the opening closed. Care must be taken that air is not allowed to enter the sac of the pleura.

Treatment of empyema.—When, from the long continuance of the disease, the failure of the usual means of procuring absorption, the steadily increasing emaciation, and the hectic accessions of fever, there is ground for believing that the fluid is puriform, a small opening is to be made with a grooved needle or narrow bistoury. If the small quantity of fluid which oozes out is clearly pus, the opening is to be enlarged until it is sufficiently free to allow of ready discharge. If the pus is thick and clotted, so as not to flow out readily, it may be washed out by injecting tepid water, and this may be medicated by some antiseptic, as creosote, chloride of soda, &c. Benefit is said to have been derived from the injection, every two or three days, of a very weak solution of iodide of potassium—(one part of iodide of potassium, ten parts of tincture of iodine, and a hundred parts of water; 4 ozs. to be injected each time).

Treatment of pneumo-thorax.—The treatment of pneumothorax is in fact the treatment of pleuritis, which the presence of air in the sac of the pleura excites. In the collapse which sometimes occurs on the first admission of air, stimulants will be required; and should the air accumulate to so great an extent as to cause serious pressure on important organs, an opening for its discharge should be made, as in empyema.

PNEUMONIA.—*Inflammation of the parenchyma of the lung.*—Pneumonia is rare in European residents, but common in natives of tropical countries. It may be primary, or secondary upon febrile and certain organic diseases, as malarious fevers, the exanthemata, Bright's disease, &c.

Anatomical characters.—Three conditions of the lung are found after death. They represent the stages or periods of the inflammation which may be recognized during life.

1st stage.—Engorgement.—The lung is of a deep red colour and filled with blood ; it pits on pressure, and when cut into, gives exit to a frothy, red-looking fluid. Although heavier than other portions, the affected part readily floats, and crepitates freely when pressed—the air cells are not obliterated, although their size is diminished by the distended vessels. The cohesion of the texture is lessened : it tears readily under the finger, and by this, inflammatory congestion may be distinguished from pulmonary œdema.

2nd stage.—Red hepatization.—The density of the tissue is much increased ; there is no longer crepitation, and a piece of lung placed in water sinks. The air cells are filled with solid lymph, which gives the cut surface a granular appearance. The blood in the capillary vessels is stagnant and coagulated. The colour of the hepatized lung is either deep red, or reddish or grayish brown—the difference depending upon the relative proportion which the blood and lymph bear to one another. There is much softening—the parenchyma readily breaking down under pressure. The lung, in the condition just described, has been compared to a piece of liver—hence the term hepatization. The consolidation sometimes appears in circumscribed nodules with healthy lung between them ; this is common in children, and has been thought to denote inflammation confined to the lobules. It is probable that this appearance is more often due to carnification or pulmonary apoplexy.

3rd stage.—Gray hepatization.—The air cells are filled with lymph, and the intercellular tissue is emptied of blood. The lung is of a whitish or grayish white colour, soft, and lacerable. Very generally, in fatal cases, the effusion has become softened and converted into pus—thus constituting the stage of suppuration or purulent infiltration. By pressure with the finger, pus mixed with blood may be made to exude, and even small cavities produced, which must not be mistaken for abscesses. In some cases, the pus is not infiltrated, but circumscribed, so as to form one or more abscesses: whether this *ever* occurs independently of pyœmia or embolism, requires further investigation. It is quite possible, that the inflammatory product may undergo a process of liquefaction, and be removed without suppuration having occurred.

In asthenic natives of India, it is not uncommon to find the lung consolidated, of a grayish white colour, and *indurated.* There is ground for believing that in this condition it may continue for a long time without change.

Gangrene is described as an occasional, though very rare, result of pneumonia. In the asthenic natives of Bombay, it is not unfrequently met with. A portion, or the whole of one of the lobes is excavated, the cavity having ragged walls, and being filled with a dirty, stinking, semifluid matter. Sometimes the sloughy mass gradually merges into the surrounding healthy tissue; at others there is a circumscribed, abrupt line of separation.

When persons die somewhat suddenly, the lungs being consolidated, it is not uncommon to find decolorised fibrinous coagula in the cavities of the heart.

In most fatal cases there are the morbid appearances of pleuritis, limited to the immediate seat or neighbourhood of the inflamed lung; but the pleuritis may be more extensive, and sometimes it is general. The bronchial tubes are reddened, and contain a tenacious mucous secretion, or puriform or muco-puriform fluid.

Symptoms.—The prominent symptoms of pneumonia are cough, with adhesive mucous expectoration, sometimes rusty-coloured, pain in some part of the chest, hurried breathing, and febrile disturbance. The physical signs are at first crepitant rhoncus, and slightly impeded expansive movement of the chest; afterwards more or less complete dulness, bronchial or tubular breathing, bronchophony, and increase of the vocal thrill.

The attack often sets in with a rigor followed by fever and cough. The heat of skin is remarkable for its intensity, and in sthenic persons, is often accompanied by signs of cerebral determination, but this is rare in natives of India. The cough, at first dry or attended with adhesive mucous expectoration soon becomes urgent, and the sputum rusty. The exact tinge of discoloration is not always the same: it ranges from a bright red to a dark yellow, and occasionally the expectoration looks as if mixed with bile rather than blood. In asthenic persons, the rusty sputa are often wanting. The breathing is from the first quickened, and soon becomes hurried, and diaphragmatic on the affected side. The respirations number from 30 to 40, or even 50 or 60 in the minute. The pulse is usually above 100, and sometimes reaches 120 or 130 in the minute. In sthenic persons it is sharp and even hard, but in others small and easily compressible.

When the disease is fully developed, the face is often flushed and anxious, and the alæ nasi are in frequent action; the febrile symptoms are well marked, and the tongue coated, or florid and dryish. The pain varies much in intensity and situation, and depends upon the extent to which the pleura is involved: sometimes it is severe and acute in one or more of the intercostal spaces of the affected side, but more frequently is central, and rather a feeling of soreness than actual pain. In not a few cases it is absent. Delirium is an occasional symptom, and when it comes on in the early stage of pneumonia, always indicates danger.

Physical signs.—At the commencement of the attack, the expansive movements of the chest are restrained, and this is most evident when lateral pain is present. The percussion sound is a shade below the natural resonance, due no doubt to the distended vessels pressing the air cells, and thus impeding the entrance of air. But the most constant and characteristic physical sign, is a fine crepitant rhoncus, heard towards the end of inspiration. Should the inflammation not be checked, exudation takes place into the cells, and becoming solid by the absorption of its fluid portion, blocks them up, and thus prevents, to a geater or less extent, the ingress of air. The chest over the affected lobe now becomes dull to percussion, the breathing harsh and blowing, the voice preternaturally resonant, and the vocal thrill exaggerated. Here and there, in the neighbourhood of the consolidated lung, the crepitant rhoncus is occasionally heard. At a later period, when the effusion begins to soften and liquefy, a sub-crepitant rhoncus becomes audible, and when this is coincident with returning resonance and the subsidence of symptoms, it is named *crepitus redux*. Should the quantity of liquefied exudation be considerable, so as to fill bronchial tubes of some size, the large crepitant or mucous displaces the sub-crepitant rhoncus, and when the dulness on percussion continues, denotes the third or suppurative stage. Should there be abscess communicating with a bronchial tube, the chest may be resonant over it from air having entered the cavity, and there may be amphoric breathing or even metallic tinkling and pectoriloquy. Throughout the attack, pleuritic friction sounds are often present, and sometimes the signs of pleuritic effusion.

The character of the sputum requires special notice: at first, in all cases, it is transparent, adhesive mucus, and so adhesive, that it will stick to the vessel in which it is collected even when turned upside down. As the lung becomes consolidated, the expectoration assumes, in sthenic persons, the appearance of being mixed with iron rust, but this is not generally the case in asthenic persons, in whom it often retains the characters first noticed throughout the attack, or if discoloured, looks as if tinged with biliary colouring matter. Sometimes the cough is dry throughout the whole course of the attack, and it very generally is so during the first few days of it. In a small proportion of cases of pneumonia of long standing, whether in the second or third stage, the expectoration is very copious, muco-puriform, and of a brick red colour, very closely resembling what is expectorated when abscess of the liver opens into the lung. As the inflammation declines, the sputum loses its transparency and becomes opaque. Should the inflammation pass into the suppurative stage, it becomes thin, puriform, of a dark colour, and like prune or liquorish juice, and very fetid. Chemical analysis has shown, that whilst the pneumonia is extending, the expectoration contains chloride of sodium, which is absent from the urine.

The cough and dyspnœa are often of little urgency, and especially in asthenic persons. The dyspnœa is not in proportion to the extent of the pneumonia: it is influenced by the relation between the quantity of blood in the system and the extent of the aërating surface; also by the rapidity with which a portion of the lung has been rendered unfit for the performance of its function—hence it is most marked in sthenic individuals in whom the attack has been sudden. In asthenic persons on the other hand, when the quantity of blood is much reduced, pneumonia of even the whole of one or more lobes may exist without dyspnœa being a marked symptom.

Pain is a very uncertain symptom: sometimes entirely absent, it may at other times be severe and acute. Not unfrequently it is felt beneath the margin of the ribs, and is then increased by pressure upwards. This has been described as sympathetic pain, or, when on the right side, as due to congestion of the liver. It is only present when the lower lobes of the lung are involved, and, I believe, solely depends upon the pleura covering the convex surface of the diaphragm being inflamed. The general disturbance in pneumonia does not at first differ from the sympathetic fever of other inflammatory diseases, except that the heat of skin is remarkable for its intensity. In the third, or even second stage, when this is long continued, it assumes the hectic type. Should gangrene have taken place, it is changed into the worst kind of irritative fever. Now and then the fever is adynamic or typhoid from the first.

Progress. 1*st.*—*Towards recovery.* (*a.*)—The symptoms gradually disappear at the end of three or four days; the skin becomes cool and moist, the pulse and respiration less frequent, and the expectoration more abundant and opaque. The crackling or crepitant rhoncus ceases, and the healthy vesicular murmur returns; should there have been dulness on percussion, "crepitus redux" sometimes precedes the healthy vesicular murmur.

(*b.*)—The febrile disturbance subsides, the pulse and breathing are more natural, and the appetite returns. The cough however continues, the chest is dull, and the breathing harsh and tubular—convalescence may thus be delayed for weeks or even months. This is not uncommon in the asthenic native residents in Bombay. At length the expectoration becomes more abundant and opaque, the dulness clears up, and "crepitus redux" or healthy vesicular is heard in place of the bronchial breathing. Coincident with these changes, profuse (critical?) discharges from the skin, or bowels, or kidney, are often observed.

2nd.—Towards death. (*a.*)—The lung being consolidated, the breathing becomes more oppressed, the face livid, the skin of the extremities cold and clammy, and the pulse very feeble. Death takes place partly by apnœa and partly by syncope. The fatal termination in this stage of the disease is often influenced by the extent of the inflammation; but in some cases of partial pneumonia, it appears to be immediately occasioned by fibrinous concretions in the heart.

(*b.*)—The symptoms having existed without abatement for several days, the patient exhibits signs of exhaustion: the face is pale and the eyes are sunken; the skin is cold and clammy, or covered with profuse perspiration, the pulse rapid and feeble, or barely perceptible, the cough more urgent, and the expectoration copious, fetid, of a dark colour like prune juice or liquorish water. The fever assumes a hectic type, and the patient rapidly sinks.

(*c.*)—In rare cases, the breath becomes very fetid, a dark-coloured fluid is expectorated, mixed with shreds of sloughing tissue. There are signs of great depression and exhaustion. On listening to the chest, large moist rhonci and even gurgling are heard.

(*d.*)—It is not very uncommon, when the lungs are consolidated, for the patient to be suddenly seized with urgent dyspnœa and great restlessness. The face becomes pale and pinched, the skin cold and clammy, and the pulse very feeble. Death follows in a few hours. In these cases, fibrinous coagula will probably be found in the cavities of the heart.

Prognosis.—In primary or uncomplicated pneumonia, the prognosis is in general favourable, provided that one lung is alone affected, and the patient not weakened by old age, or very asthenic from other causes. In double pneumonia the danger is greater, and that which is secondary upon Bright's disease or tubercular deposition is often fatal. Pneumonia, as a complication of malarious fevers, does not appear to materially influence the termination of those diseases. When pneumonia is in the third stage, the prognosis must be very guarded, and it is decidedly unfavourable when gangrene has taken place.

Causes.—Asthenic or weakly people are without doubt more liable than others to pulmonary inflammation, and hence all the causes of asthenia may be assigned as predisposing causes of pneumonia. The exciting cause is generally cold or sudden change of temperature.

Pathology.—For the most part, the inflammation involves the whole of the pulmonary parenchyma, viz. the minute ramifications of the bronchial tubes, the air cells, and the intercellular tissue. Whether it is ever limited to any one of those constituents is uncertain and perhaps unimportant. Almost the first step in the process, is the accumulation and stagnation of blood in the pulmonary capillaries; the air cells become more or less filled with a tenacious mucus, which in many instances is intimately mixed with the colouring matter of the blood—afterwards lymph is effused, which becomes solid. The air cells are now blocked up, and compressed by the distended blood vessels, and perhaps by exudation into the inter-vesicular tissue. After a longer or shorter interval, the exudation softens and liquefies, and may be got rid of by absorption and expectoration, or, being converted into pus, lead to softening and destruction of the pulmonary tissue.

The question has been raised, as to whether the bronchial or pulmonary capillaries are concerned in pneumonia. Its solution will mainly turn upon, whether the latter are or are not nutrient of the air cells. There is the best reason for believing that the bronchial capillaries do not extend beyond the intercellular passages; in which case, the blood in the pulmonary capillaries is the only blood distributed to the air cells, and consequently their nutrition must be derived from it. Nor is there any reason why it should not be: the blood in those vessels is as fitted for nutrition as that in the bronchial or any other artery; it is in sufficiently close relation with the tissue to be nourished, and although it may have been brought to the lung for a special object, yet, when that object has been fulfilled, it in no way differs from arterial blood in any other situation. All that seems necessary for nutrition is, that blood of certain quality should be brought into proximity with a tissue, and by a vehicle which will admit of transudation of the liquor sanguinis.

Pneumonia is more common in the right than in the left lung, and in the lower than in the upper lobe. Dr. Morehead believes that, in regard to the latter statement, the disproportion is not so great as is generally supposed. My own experience, in very much the same field of observation, tends to establish the same fact.

The connection of pneumonia with malarious fever is, from the frequency of its occurrence, an important part of its pathology. Whether the relation is simply one of cause and effect, the congestion in which the pneumonia may be supposed to originate being the result of the febrile reaction; or whether the cause of the fever may not also be more directly the cause of the pneumonia, are points which are yet to be determined. The relation between pneumonia and the contagious fevers is well established. It is also thought to be a not unimportant part of the pathology of Bright's disease; but upon this latter point further observation is required.

Perhaps the most peculiar features in the course of pneumonia in the asthenic natives of tropical climates, are the comparative infrequency of the third or suppurative stage, and the greater frequency of gangrene.

Varieties of pneumonia.—Pneumonia of the whole or greater part of a lobe is called *lobar;* limited to distinct spots surrounded by healthy tissue, *lobular;* accompanied by adynamic or typhoid symptoms, *typhoid;* affecting both lungs, *double.*

CHRONIC PNEUMONIA.—Chronic pneumonia, unconnected with diathetic conditions, is very rare. The consolidation produced by an acute attack should not be mistaken for it.*

It is quite possible that chronic pneumonia, in the true sense of the term, may follow acute inflammation, but more frequently it is secondary upon some other disease. There is cough with scanty expectoration, followed by gradual loss of flesh, and hectic accessions of fever. Flattening and dulness of the chest, weak or bronchial breathing are the chief physical signs. A condition of the lung, resembling cirrhosis of the liver, has been occasionally noticed.

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* If acute pneumonia is acute inflammation of the lungs, chronic pneumonia is chronic inflammation—that is, a disease which is progessive, and which, if not checked, will lead to ulterior changes. It is clearly therefore wrong to reckon as chronic pneumonia induration or other change in the lung, which is the result of acute inflammation that has ceased.

For the sake of precision, pneumonia may be summarily divided into three stages, characterized by the following symptoms and physical signs :—

1*st stage.*—*Engorgement.*—Cough, adhesive mucous expectoration, fever, defective expansion and resonance of the chest, fine crepitant rhoncus.

2*nd stage.*—*Hepatization.*—Increased cough, rusty sputa, more fever, dulness, bronchial breathing, bronchophony, increased vocal thrill, sub-crepitant and crepitant rhoncus.

3*rd stage.*—*Suppuration.*—Symptoms of exhaustion, hectic fever, much cough, fetid expectoration—thin and sanious—dulness, large crepitant or mucous rhoncus.

It must not be supposed that these stages are always distinct: very often one runs into another, and they may indeed co-exist in the same lung or portion of it.

Diagnosis.—In the first stage, pneumonia may be distinguished from pleuritis by the less severe pain, more marked cough, adhesive expectoration, and above all, by the crepitant rhoncus. By the latter physical sign it may also, when there is pain beneath the margin of the right ribs, be known from hepatitis.

The second stage of pneumonia requires to be distinguished from pleuritis with effusion. The cough and rusty-coloured expectoration, especially the latter, and the comparatively little severity of the pain, will sometimes throw much light upon the case. But the cough may be slight, and the rusty coloured sputa wanting, and we must then found the diagnosis chiefly on physical signs, which have the following differential characters :—

Pneumonia.—Dulness not complete and not varying on change of posture; tubular breathing, bronchophony, increase of vocal thrill. *Pleuritis.*—Dulness complete (wooden), varying with change of posture, absence of breath sounds—except at upper part of chest or near vertebral column—also of bronchophony and vocal thrill, presence of œgophony, bulging of chest and effacement of intercostal spaces.

When the chest is completely filled with fluid, some of the signs of pleuritis are wanting. In such cases the chest is enlarged, the intercostal spaces effaced, and the dulness extends beyond the median line.

Treatment.—The treatment of pneumonia is to be conducted upon ordinary principles, due regard being had to the stage of the disease, the character of the symptoms, and the constitution of the patient.

In the early stage, in sthenic persons, general or local bleeding will be required. In the natives of, or residents in Bombay, the former is seldom indicated. Antimony, in doses of from one quarter to three quarters of a grain, and eliminants—as nitrate or bicarbonate of potass—are to be given after blood has been abstracted. When the lung has become hepatized, eliminants may be continued; counter-irritants, and should there be evidence of local pleuritis, leeches are to be applied. Should the lung remain consolidated, after inflammation has ceased, the iodide of potassium or the liquor of potass may be given, and counter-irritation by croton oil liniment or tartar emetic ointment kept up. Should symptoms of depression come on, stimulants are to be used; of these, the sesquicarbonate of ammonia, in doses of from six to eight grains, combined with chloric and nitric ether, is the best.

Asthenic cases, in which the skin is cold and the pulse very feeble, require stimulating treatment from the commencement. The chest should be stuped with turpentine, and as much nutritious food administered as the digestive organs will bear. Wine, and even brandy should be freely given. Between the sthenic and asthenic cases of pneumonia, there is a class which might be called "intermediate," and in the treatment of which much judgment is required. They chiefly differ from sthenic cases, in the pulse being small and easily compressed, and from the asthenic, in the skin being above the natural temperature. The cautious application of leeches, when local pain is complained of, and of turpentine stupes to the chest, the administration of sedatives and eliminants, followed by stimulants—should the vital powers flag,—a diet that is moderately nutritious but not stimulating, are the measures to be adopted.

In all cases, where there is reason to believe that there has been malarious influence, quinine should be freely given.

PHTHISIS.—*Pulmonary consumption.—Tubercular disease of the lung.*

Phthisis and tubercular consumption are terms used to designate disease of the lung, depending upon the deposit of tubercle in the air cells, intercellular tissue, and minute bronchial tubes. It is a common and dangerous disease. In England, phthisis is twice as fatal as any other malady, and is believed to cause about one-sixth or one-seventh of all the deaths north of the tropics. Although it may not prevail to the same extent in tropical regions, it is nevertheless even there anything but a rare affection. The admissions from phthisis in the Jamsetjee Jejeebhoy Hospital at Bombay, have averaged ninety annually during the last fourteen years. The records of disease in the Bengal Presidency, afford ample evidence of the frequent occurrence of phthisis in the jails and amongst the native population in various part of the country.*

Pathology and anatomical characters.—The pathology of tubercle has been fully considered in General Pathology (page 65). Tubercular deposit is most common in the upper lobes of the lung, and it is said (though this is doubtful) to be more common in the left than in the right lung. It may exist as minute particles in either the gray or yellow form, but masses of larger size are composed of both varieties. The deposits may be isolated and scattered, not larger than a pin's head, or grouped so as to form masses of considerable size, whereby the air cells are to a greater or less extent obliterated and the lung consolidated. The tubercle once deposited, may remain without change for a longer or shorter time, but more frequently it is added to by further deposits, and sooner or later it softens. When the process of softening commences, inflammation of the surrounding pulmonary parenchyma takes place, pus is formed, and the tissue itself breaks down. In this way an abscess or vomica results, the contents of which are tubercle, pus, and the debris of softened pulmonary tissue. The surrounding inflammation may be very limited in extent, or occupy a considerable part of a lobe. The abscess or vomica is usually restricted to the neighbourhood of the tubercle, but inflammatory consolidation may extend much beyond it. The abscess may discharge through the bronchial tubes, and should there be no other tubercular deposit, and the predisposition to a fresh deposit slight, the cavity may be obliterated and the patient recover. More frequently, however, fresh tubercles are deposited at the sides of the vomica, and tubercles in other parts of the lung successively soften.

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* Indian Annals, No. 111, page 182.

In some instances, tubercle appears to be deposited with extreme rapidity and in large quantity : the whole of both lungs may be occupied by it, death taking place very rapidly before disorganization has commenced. During the formation of a vomica, much constitutional disturbance is set up—the fever being of the hectic type.

Every now and then a vomica, in place of opening into the bronchial tubes, makes its way through the pleura, and discharges its contents into the sac of that membrane, causing pneumo-thorax and empyema.

There is no reason to suppose that the deposit of tubercle is always the result of inflammation, although it is certain, that a stasis of blood in any part favours its separation from the vessels.

The tubercular deposit is not restricted to the lungs, being often met with in the larynx and the glandular structures of the small intestines.

Morbid appearances.—The lungs—generally the upper lobes—contain vomicæ varying in size and number ; sometimes these are so numerous, that the lung has been compared in appearance to a honey comb. In size they may vary from that of a pea to that of a large orange. Around the vomica, the lung is consolidated by crude tubercle in masses of various sizes, and by the exudations of pneumonia ; and beyond this again, there is more or less congestion. Not unfrequently, there is extensive pneumonic consolidation, which is often the immediate cause of death. In some instances, the upper part of the lung is solidified by tubercle, whilst the lower part is the seat of red hepatization. The deposit may be limited to one lung, but in the majority of cases, both lungs are diseased. The pleura is inflamed opposite the seat of the deposit, but general pleuritis is very rare, unless a vomica has opened into the pleural sac. Sometimes there are appearances which indicate the obliteration of a vomica, viz. a fibro-cartilaginous cicatrix, or calcareous matter.

The tubercular matter is met with in different conditions. In the part of the lung least affected, there are scattered miliary tubercles; in others masses of crude tubercle, in which the process of softening may or may not have commenced.

The morbid appearances are not in general confined to the lungs: Peyer's glands are often ulcerated, as is also the lining membrane of the larynx; the ulcers doubtless result from the deposit of tubercle. The mesenteric glands are enlarged, and the liver is affected with fatty degeneration.

Physical signs.—At first, when the deposit is limited to isolated miliary tubercles, the respiratory murmur is feeble or harsh, and the expiratory portion of it prolonged. As intercurrent bronchitis is not uncommon in this early stage, sibilant, and sometimes sonorous rhonci will often be heard. The tubercular deposit increasing, the air cells are filled and obliterated, and more or less consolidation is produced. There will now be impaired movement and flattening of the chest over the affected part of the lung, and less than the usual resonance, or even dulness on percussion, and the resiliency of the walls of the chest will be diminished. The respiratory murmur is no longer heard, its place being taken by bronchial or tubular breathing; the voice is preternaturally resonant, and the vocal *fremitus* more marked than on the opposite side. The sounds of the heart are unusually distinct in that part of the chest which is wanting in resonance. When the tubercles begin to soften, new sounds are heard: inflammation having been excited in the pulmonary tissue surrounding the tubercle, a true crepitant rhoncus may sometimes be detected, but in most instances this is soon obscured by the bubbling of air through the softened tubercle. The rhoncus is therefore sub-crepitant, and when the vomica is of some size, and the communication with the bronchial tubes free, the bubbles are so large as to cause gurgling (cavernous rhoncus). Should the cavity be empty, gurgling will not be heard, but in place of it, harsh blowing respiration (cavernous respiration). In many instances, the percussion sound over the cavity has a metallic ring. The voice is unusually resonant, and sometimes it seems to pass along the stethoscope into the ear with such force, as actually to cause pain.

Symptoms.—The prominent symptoms of phthisis are cough, loss of flesh and strength, hectic attacks of fever, and in the advanced stage, profuse sweating, alternating with diarrhœa.

The mode of commencement of phthisis is not always the same. In some instances there are dyspeptic symptoms, with a falling off in flesh and strength. After a longer or shorter time cough sets in. But sometimes cough is the earliest symptom, the health not being much deteriorated; and in other cases, a sudden attack of hæmoptysis first directs attention to the chest. The commencement of phthisis may sometimes be suspected, by observing that the patient's breath becomes short on the slightest unusual exercise, and that he is easily fatigued. Not unfrequently, there are fugitive pains in the chest. The cough is generally at first very slight, and confined to the early morning, and the expectoration, if any, is transparent mucus. The duration of these symptoms, before others more characteristic make their appearance, is very various; many months or even years may elapse, the individual being unfit for any violent exertion, but still capable of performing the ordinary duties of life. At this period the physical signs are by no means characteristic. In most instances the resonance under one or both clavicles may be slightly impaired, and the respiratory murmur feeble or harsh, the expiratory part of the sound being prolonged. As the disease advances, the cough becomes more urgent and continuous, the strength fails more rapidly, and slight hectic accessions of fever are noticed towards evening; the breath is shorter, and dyspnœa and palpitation of the heart are produced by slight exertion. The expectoration may be glairy-mucus or muco-puriform from the bronchial tubes, tinged or not with blood, or there may be hæmoptysis; and when this occurs, the symptoms are often alleviated for a time. From the commencement, the pulse in most cases is above the natural frequency. On examining the chest at this stage, dulness on percussion will be detected in the clavicular or scapular regions, and harsh or even bronchial breathing; the vocal resonance and fremitus will be increased, and the sounds of the heart unusually audible. Sibilant, sonorous, and sub-crepitant rhonci, from intercurrent bronchitis, are very generally heard. The symptoms just noticed may be prolonged, with remissions and exacerbations, for a considerable time; during which there may be repeated attacks of hæmoptysis. At length the cough becomes more troublesome and attended with puriform expectoration in detached masses, in the centre of which tubercle may be detected by the microscope. There is much dyspnœa on the slightest exertion, and very often hoarseness of the voice; the hectic accessions are severe, and the sweating during sleep very profuse. In females, the catamenial discharge is suspended. Pain, often severe, is complained of in the chest, and a feeling of weight and oppression; the appetite is often lost, though sometimes it is unusually great; the feet become œdematous towards evening, and the emaciation rapidly increases. The tubercular matter has now softened, and one or many vomicæ or cavities have formed in the lungs. The physical signs are in general very characteristic. Over a vomica, the percussion will usually be dull, and the resistance of the walls of the chest increased. Gurgling (cavernous rhoncus) or cavernous respiration will be heard. In some instances the respiration is amphoric; this happens when the cavity is large and the walls are dense and unyielding. When the cavity is near the surface, the percussion sound may be tympanitic or amphoric, and sometimes the "cracked-pot sound" may be heard. Increased resonance of voice (pectoriloquy) is not uncommon.

A vomica having formed, the contents may be discharged through the bronchial tubes, and the symptoms gradually subside. In a few instances the cure may be permanent; but in the great majority of cases the symptoms return, owing to the formation of another vomica. In a large proportion of cases, there is no amendment on the opening of the vomica; on the contrary, the expectoration becomes more and more copious, and the strength more and more reduced; diarrhœa sets in, and is sometimes uncontrollable; aphthæ appear on the mucous membrane of the mouth, and the patient at length sinks from exhaustion, the mind being unaffected to the last.

It sometimes happens during the course of phthisis, that sudden pain is felt in one side of the chest, followed by dyspnœa and collapse. The percussion note on the painful side is preternaturally resonant, but the breath-sounds are feebly if at all heard; the lower part of the chest soon becomes dull, and breath-sounds disappear. We have thus evidence that the vomica has opened into the sac of the pleura.

Some of the symptoms of phthisis require separate notice.

Hæmoptysis.—The occurrence of hæmoptysis, unconnected with disease of the heart or injury of the chest, is very important in the early stage of suspected phthisis, but its absence is a negative sign of little value: in the cases of phthisis treated in the Clinical Ward of the Jamsetjee Jejeebhoy Hospital, it has been present in but a small proportion. It is seldom so profuse as to be dangerous to life, and when moderate in quantity, appears to delay the progress of the disease, probably by relieving congestion. This remark, however, does not apply to the advanced stages. Although hæmoptysis is undoubtedly alarming as indicating the existence of tubercle, its importance must not be over estimated. It accords with the experience of Dr. Williams and Dr. Wood, that hæmoptysis does occur in persons who are free from organic disease. My own much more limited experience leads me to the conclusion, that hæmorrhage from the lungs in males is extremely rare when it is not traceable to tubercle, disease of the heart, or external injury.

Pulse.—A frequent pulse, along with some of the premonitory or early signs of phthisis, is of much value as a diagnostic sign, and such frequency may sometimes be noticed when there is no other symptom than a slight dry cough. As the disease makes progress, the frequency increases, so that in the advanced stages, it is not uncommon to count a pulse of 120 beats in a minute.

Night sweats.—Night sweats are amongst the most prominent and distressing of the symptoms of phthisis. They are not always related to the severity of the hectic fever, and are sometimes most profuse when the febrile reaction is scarcely perceptible. Amongst the native patients in the Jamsetjee Jejeebhoy Hospital they are often absent.

Loss of flesh.—Progressively increasing emaciation, without any apparent cause is, and especially in young persons, a symptom which should excite anxious attention. If associated with cough, it very frequently indicates the commencement of phthisis.

Appetite.—The desire for food varies at different periods of the disease; at first it is but slight, but afterwards, when the disease is fairly established, it often increases, and in the advanced stages often becomes inordinate.

Bronchial symptoms.—The persistence of bronchial cough, with the physical signs of bronchitis limited to the clavicular regions, is always suspicious.

Progress and duration.—Sometimes miliary tubercle is deposited so copiously and generally, that the disease runs its course with great rapidity, death occurring within a few weeks. Many cases of phthisis set in with symptoms of pneumonia and terminate within a month or two. On the other hand, persons with the symptoms and physical signs of phthisis have lived for as many as twenty or more years. A great number die within a year. From two to four years is stated to be the average duration of the disease. During its progress, there may be periods of amendment of longer or shorter duration; and not only may the symptoms subside, but the patient may gain flesh and strength. In some instances, where the tubercle is limited in amount, and does not soften, there is permanent ill-health for a long time without any chest symptoms. In others, there are attacks of cough and purulent expectoration, with hectic fever. After a time these symptoms subside, and the patient gains flesh and strength.

Causes.—The predisposing causes have already been noticed at page 68.

Exciting causes.—Amongst the exciting causes, are those which produce determination of blood to the lungs, cold and alternations of temperature being the most efficient. The irritation of foreign substances, introduced during respiration, also cause determination: predisposed persons, who are employed in stone cutting or in needle pointing, &c. often suffer from minute particles of stone or iron reaching the small bronchial tubes and air cells.

The sudden suppression of long standing discharges seems to excite, or at all events to hasten, the progress of phthisis; and this has been especially noticed in the healing of fistula in ano. Age and sex also appear to exercise some influence: phthisis is rare before puberty, and most common about the period of, or soon after, the completion of growth; but it occurs more often in elderly persons than is sometimes supposed. It is more common in females than males.

Many febrile diseases are often followed by phthisis, as small-pox and the exanthemata generally, typhoid fever, &c. The effect of a cold, damp climate in exciting phthisis is well known; at the same time, hot and dry climates do not afford the immunity from this disease that has sometimes been strongly stated.

Diagnosis.—It is very important to recognise phthisis in the early stage. The symptoms on which most reliance should be placed, are short dry cough without catarrhal symptoms, a pulse always above the natural frequency, shortness of breath, and palpitation on slight exertion. If with these symptoms there is loss of flesh, defective resonance or any abnormal sound restricted to the clavicular or scapular regions, the suspicion of phthisis is very great, and all doubt is often removed by an attack of hæmoptysis. A persistent cough, with hoarseness, should the patient not be syphilitic, is very suspicious of phthisis, as also is obstinate dyspepsia in a young person. The physical signs, on which most stress should be placed in the very early stage of phthisis are, according to Dr. Walshe, harsh respiration at either apex, slight dulness and a few clicks of dry crackling rhoncus. The early stage of phthisis may be distinguished from bronchitis, by the limitation of the bronchial sounds to the clavicular or scapular regions, by the diminished mobility of the upper ribs, and perhaps, impaired resonance. It is also worthy of notice, as pointed out by Dr. Watson, that some degree of expectoration attends the cough of bronchitis from the first, whilst the cough of phthisis is often for a long while dry, and that the pain of bronchitis is generally at the middle of the chest—that of phthisis at the sides. The occurrence of hæmoptysis in phthisis, and its absence in bronchitis, should not be overlooked. The advanced stages of phthisis require to be distinguished from chronic bronchitis with dilatation of the bronchial tubes. The occurrence of hæmoptysis would be almost decisive of phthisis; but in its absence, the distinction chiefly rests upon the physical signs. In both affections, there will be the physical signs of a cavity; but in bronchitis, they will not be at the upper part of the chest, as in phthisis; and there will be no dulness surrounding the spot where the cavity appears to exist.

The diagnosis between phthisis and pneumonia of the upper lobes, cannot always be made with certainty. The distinction mainly rests upon the history of the patient and the attendant circumstances.

Prognosis.—That phthisis is not necessarily a fatal disease is now admitted. Recovery may take place both from its early and advanced stages. Nevertheless, by far the greater number of cases terminate fatally; hence the prognosis is unfavourable. But although this is so as regards complete and permanent recovery, yet the course of the disease may often be retarded and life prolonged for many years.

Treatment.—The indications of treatment in phthisis are—1, to prevent the further deposit of tubercle; 2, to promote its removal and remedy the effects of it; 3, to alleviate symptoms.

To prevent the further deposit of tubercle, the tone and vigour of the whole system should be improved. Free exercise in the open air, continued for weeks and months; attention to the digestive organs; frictions to the skin; removal from a very cold to a warmer climate, or *vice versa,* the removal from a very hot to a somewhat colder climate are of great importance. Next to these is the regulation of diet: food should be abundant and nutritious, but not over-stimulating. If the digestion is good, and the patient, under active exercise and a good diet, should gain strength, the less medicine that is given the better. But should he continue weak and anæmic, tonic medicines are to be prescribed. The vegetable bitters or the preparations of iron may be tried; but of all medicines, the most useful is cod liver oil. It improves digestion, supplies fatty matter, and seems so to act upon the nutritive function, as to diminish the tendency to deposit of tubercle. Under its use, patients often gain much in flesh, the colliquative sweats are suspended, the appetite improves, and the cough and expectoration diminish. As the deposit of tubercle is often immediately brought about by inflammation of, or determination of blood to, the lungs, the greatest care should be taken to guard against those derangements: warm clothing, protection from sudden changes or vicissitudes of temperature, or from the inhalation of noxious gases or other irritating matters, are of great importance.

To promote the removal of tubercle, and remedy its effects, a variety of treatment has been adopted. Counter-irritation is entitled to most confidence—blisters of small size may be applied and repeated, or more permanent irritation may be kept up by liniments containing ammonia, croton oil, or turpentine. The application of iodine, and of cod liver and cocoanut oils to the chest has been often of service. The general health must be improved in every way, and with this object, tonic medicines should be given: iodide of iron, and tincture of the sesquichloride of iron, are valuable medicines; the mineral acids and vegetable bitters are also useful in improving the appetite. Dr. Walshe speaks favourably of liquor potassæ combined with a sedative and bitter tonic.

The secondary effects of tubercular deposition require careful management.

Pneumonia and bronchitis.—Inflammation of the pulmonary tissue and bronchial tubes must be treated upon ordinary principles, but with as little abstraction of blood as possible. Blisters and antimony or ipecacuanha will usually suffice.

Hæmoptysis.—When hæmoptysis occurs in the earlier stages of phthisis, and is moderate in quantity, and not of long duration, it seldom requires to be interfered with, beyond keeping the patient quiet, and perhaps determining to the liver and intestinal canal by a mild aperient. When it occurs in the advanced stages, or is in large quantity at any stage, it should, if possible, be checked. If fever is present, the patient should be confined to bed in a cold, well-ventilated room, and placed upon a low diet. Sedatives and depressants may be given, as antimony, ipecacuanha, &c. Congestion of the lungs, in tolerably strong persons, may be reduced by leeching or cupping the chest, and by the application of a blister. When the fever has been subdued, or should there have been little or none, astringents should be given, combined with small doses of opium. It is said that a little common salt, taken undissolved into the mouth, and swallowed in that state, will often at once check the hæmorrhage when other means have failed; turpentine has also sometimes been successful.

Cough.—The cough in phthisis is chiefly due to intercurrent bronchitis, and is often one of the most troublesome symptoms. In the early stage nauseants, as antimony and ipecacuanha combined with opium, are useful. Afterwards, when the sputa have become opaque, some of the more stimulating expectorants, as squills, senega root, &c. are preferable. As cough prevents sleep, and is in that way often very distressing, its relief becomes a matter of great importance. Various combinations of expectorants, sedatives, and opiates have been recommended. The following draught I have found to give much relief:—Spirit. ether. nitric. ʒss.; ether chloric. ♏. xv.; tinct. camph. comp. ʒss.; mist. amygdal. ʒiii.; tinct. morph. ♏. x.; aquæ ℥iss.

According to Dr. Walshe, three or four leeches, applied above the sternal notch, have often succeeded when medicines have failed.

Nausea and vomiting.—Nausea and vomiting may be relieved by small doses of hydrocyanic acid or creosote, and by restricting the diet for a short time to milk and lime water: if there is epigastric tenderness, a few leeches or a sinapism may be applied. Should these fail, bismuth and soda should be given.

Excited action of the heart.—Palpitation and irregular action of the heart are often relieved by small doses of digitalis and hydrocyanic acid.

Night sweats.—The mineral acids are generally used to diminish the night sweats, but opium, in moderately large doses, is more efficacious. Astringents, as the kino powder, gallic acid, and acetate of lead may be combined with it, especially when the bowels are relaxed. Fluid should be drunk in small quantity, and it is recommended to sponge the chest at bed time with vinegar and water.

Diarrhœa.—Purging may sometimes be kept in check by astringents, as chalk and catechu, gallic and tannic acid combined with opium. When ulceration of Peyer's glands or of the large intestine has taken place, the mineral astringents, as sulphate of copper, acetate of lead, and nitrate of silver are more efficient. In all cases they should be combined with opium. Opiate enemata are sometimes useful.

Chronic laryngitis.—The ulceration of the larynx, which is so common in phthisis, may be retarded by counter-irritation, and mopping the larynx with a strong solution of nitrate of silver.

PULMONARY EMPHYSEMA.—*Dilatation or rupture of the air cells of the Lungs.*

From causes not well understood, the air cells are sometimes dilated or ruptured, and the pulmonary tissue becomes distended with air, which is either contained in cellular spaces, or extravasated underneath the pleura. Respiration is imperfectly effected, the respiratory murmur is feeble, and the chest unusually resonant.

Anatomical characters and pathology.—When the chest is opened, the lungs do not collapse, and a number of vesicles or bladders are seen—generally along the anterior edge of the lung—which, on being laid open, are found to be dilated air cells, or larger spaces formed by the partitions of several cells having been ruptured. The walls of the cells are atrophied, and the capillary blood vessels for the most part obliterated. The emphysematous portion of the lung feels firmer and less crepitating, and is lighter than other parts. When divided, less than the usual quantity of blood escapes, and the cut surface is of a pale colour. If the lung should be dried and a section made, the size of the dilated cells and cellular spaces can be readily seen: some are not larger than a pin's head, whilst others may be of any size up to that of an orange.

The air sometimes escapes from the cells underneath the pleura, raising that membrane into vesicles, which appear on the surface of the lung (interlobular or extra vesicular emphysema). By pressure these vesicles may be made to pass from one part of the lung to another. More frequently, the air is still retained in the cells (vesicular emphysema), though, as before mentioned, several of them may have become united by destruction of the partition walls. Emphysema is usually met with in connection with bronchitis, phthisis, and pulmonary collapse, The exact way in which emphysema of the lung is caused, is not yet fully ascertained. Until within the last few years, it was thought that the air cells were dilated during expiration, in consequence of obstruction to the air in its passage outwards along the bronchial tubes. Careful observation has however shown, that obstruction in a bronchial tube by a movable plug—as a piece of inspissated mucus—leads not to dilatation, but to emptying of that part of the lung to which the tube is distributed. The explanation which is most satisfactory on the whole is, that a portion of the lung having become collapsed (*i. e.* emptied of air) or atrophied, a vacuum is formed, which, during inspiration, is filled by the expansion of the air in other portions of the lung. It is probable also that, during forcible expiration, the contraction of the abdominal muscles pushes the liver and other organs upwards, and these pressing upon the central part of the lung, propel the air, which cannot escape along the obstructed tubes from that part into the air cells of the circumference and upper lobes.*

Symptoms.—The essential symptom of emphysema is dyspnœa or shortness of breath, which, although never quite absent, is liable to be increased in paroxysms. The paroxysms are sometimes so severe, that the patient is unable to lie down, and are often excited by unusual exertion, changes of temperature, and distension of the stomach. Emphysema is commonly associated with bronchitis, in which case there is cough, with thin, frothy expectoration, and perhaps febrile disturbance; otherwise, there is no fever, and the pulse is not accelerated.

Emphysema is progressive, and when it has existed for a considerable time, the face becomes swollen and of a dusky colour, the patient has a stooping gait, the strength is reduced, and there is emaciation. Sooner or later it leads to dilatation of the right side of the heart, and symptoms of cardiac disease, as palpitation, dropsy, &c.

The physical signs are bulging of the front part of the chest, and sometimes effacement of the intercostal spaces, exaggerated resonance, feeble respiratory murmur, and prolongation of the expiratory portion of it. In addition, there are in most instances the physical signs of bronchitis, as sibilant, sonorous, and sub-crepitant rhonchi. The heart is sometimes displaced.

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* Dr. Jenner, Medico-Chirurgical Transactions.

Causes.—The causes of emphysema are bronchitis, phthisis, and everything which obstructs the air passages. Violent contraction of the muscles of the abdomen is also a cause; hence all inordinate muscular efforts have a tendency to produce it.

Prognosis.—Recovery from emphysema cannot be expected; but in itself the disease is not immediately dangerous to life. When however of long continuance, it causes such changes in the heart as are often followed by fatal results.

Treatment.—For the cure of an emphysematous condition of a lung, it is probable nothing can be done; but in the way of temporary palliation of the effects of it, much may be accomplished. Emphysema is in the great majority of cases aggravated by bronchitis, removal of which often becomes the essential part of the treatment. Should the inflammation be acute, depletion must be practised, but with much caution, and counter-irritation freely used; when chronic, expectorants and anti-spasmodics of various kinds, combined with opium, are indicated. Dr. Walshe speaks highly of the etherial tincture of lobelia inflata, with ipecacuanha, in ammoniacum mixture.

The further treatment of paroxysms of dyspnœa will be explained under asthma.

With the view of preventing paroxysms of dyspnœa, the patient should be warned against making any violent muscular exertion, such as running, lifting heavy weights, and the like, and he should carefully protect himself from the causes of bronchitis.

PULMONARY HÆMORRHAGE.

Pulmonary hæmorrhage signifies an escape of blood from the vessels of the lungs or bronchial tubes. In some instances the blood is at once coughed up (hæmoptysis), in others it coagulates in the air cells or pulmonary parenchyma (pulmonary apoplexy).

Pulmonary hæmorrhage, as already stated, is common in phthisis. It is also common in diseases of the heart and from injury of the lungs, and it sometimes occurs from separation of fibrinous casts from the bronchial tubes, and in suppression of the menses. Occasionally no cause for the hæmorrhage can be traced.

Hæmoptysis.—An attack of hæmoptysis is usually preceded by a pricking sensation in the throat, or by pain and soreness of the chest; slight cough follows, and frothy fluid and partially coagulated blood are expectorated, in quantities varying from a few drops to many pints. The blood, when in large quantity, is for the most part fluid; but when in small quantity, is often coagulated, of a dark colour, and moulded to the form of the bronchial tubes. The attack may be quite sudden, or there may be premonitory symptoms—as fulness and weight in the chest, febrile heat, flushed face, headache, &c. Whilst the bleeding is going on in the lungs, or even after it has stopped, a wheezing rhoncus is heard in the chest.

The bleeding may be so copious as to endanger life, but this is rare: very generally it gradually ceases, although in some instances not before a large quantity of blood has been lost. During its continuance, the usual symptoms of hæmorrhage are present in a degree which is proportioned to the amount of the bleeding. When the blood is rapidly poured out, there is much dyspnœa with oppression of the chest, and the face becomes livid; but when more slowly and in small quantity, it readily escapes, causing but little irritation, and hardly any cough.

There may be a single attack of hæmoptysis, or there may be many attacks extending over several days; and the bleeding having subsided, may recur at intervals of weeks or months.

Pulmonary apoplexy.—When the blood coagulates in the air cells or intercellular spaces, none is discharged by the mouth. The diagnosis must then rest upon the occurrence of sudden dyspnœa; a portion of the chest becoming dull to percussion, and the dull spot being surrounded by sub-crepitant rhonci. It must be confessed, that the diagnosis in such cases will not be easy.

Pathology of pulmonary hæmorrhage.—The bleeding may occur without breach of texture or any appearance of disease—a little redness of the inner surface of the air cells and of the minute bronchial tubes being the only morbid appearance. In some instances a ruptured vessel may be detected, but much more frequently nothing of the kind can be seen. In by far the greater number of cases, the hæmorrhage is related to pre-existing disease, either in the lungs, air passages, or heart.

In pulmonary apoplexy, circumscribed portions of the lung are consolidated, and of a dark red colour; the blood may be contained in the cells, or some of it may have been effused into the interlobular tissue and coagulated into clots, which lie in a cavity or space in the pulmonary tissue.

Causes.—The usual causes of pulmonary hæmorrhage have been already stated. It may occur without any apparent cause, and without any evidence of disease or lesion of the pulmonary structure, but this is extremely rare.

Diagnosis.—Hæmoptysis must not be mistaken for hæmorrhage from the mouth and fauces. Inspection of those parts will prevent this.

The diagnosis between hæmoptysis and hæmatemesis has been explained under the latter disease.

Treatment.—When the bleeding is such as to endanger life, the same treatment is applicable to all cases. The patient must be kept perfectly quiet, in a cool, well-ventilated room, with the shoulders raised. He should from time to time drink small quantities of cold fluid, and swallow little pieces of ice, and in very severe cases, cold may be applied to the chest. Astringents—as gallic acid, acetate of lead and opium, or small doses of turpentine may be given. Ergot of rye is said to have been sometimes very useful when other measures had failed.

When the hæmoptysis is less severe, we must be guided in the treatment by the nature of the disease with which it is associated.

In plethoric states, the abstraction of blood by venesection may be called for, and when there is febrile excitement, refrigerant cathartics and diaphoretics are indicated. The treatment of hæmoptysis in connection with phthisis and disease of the heart is considered with those affections.

PULMONARY ŒDEMA.—In states of debility, especially when there is dropsy, and in obstruction of the venous circulation, as in disease of the heart, serous fluid is apt to be effused into the air cells and pulmonary parenchyma. Air is thus impeded in its entrance, great dyspnœa is occasioned, and not unfrequently death results in a few hours from apnœa. The lung after death is found to pit on pressure, to be heavier and paler than natural, and without the usual crepitation. On section, a large quantity of frothy serum oozes out.

Pulmonary œdema may be suspected when, under any of the circumstances above noted, dyspnœa suddenly comes on, with cough and expectoration of frothy serous fluid, resonance in the chest being somewhat diminished, and a sub-crepitant rhoncus heard. Hydragogue cathartics, sinapisms to the chest, and stimulants are the remedies which should be employed.

CHAPTER II.

DISEASES OF THE AIR PASSAGES.

BRONCHITIS.—*Inflammation of the bronchial tubes.*—Bronchitis is common, and may occur at any age, but is most frequent in young children and old persons. The inflammation may affect the larger or smaller tubes, be limited to one or a part of one side, or involve both sides. The chronic form is often dependent upon some diathesis—as the gouty, rheumatic, or syphilitic.

ACUTE BRONCHITIS.—*Symptoms.*—In its *mild* form the larger divisions of the tubes are alone affected. There is cough, with soreness of the front part of the chest, and slight feverishness. Not unfrequently there is irritation of, and increased secretion from, the nasal mucous membrane (coryza), with headache and lachrymation. The attack is then often called "catarrh" or "cold on the chest," and usually subsides without treatment. In its *severe* form the smaller tubes are affected, and the attack sets in with febrile symptoms, cough, and tightness or oppression of the chest. The breathing is hurried, and the pulse frequent, but varying much in its other characters, being sometimes full and hard, but more frequently small and easily compressible. The expectoration, which is sometimes streaked with blood, is a glairy or glutinous fluid, which has been compared to the white of an egg or gumwater. It is adhesive and transparent, and its adhesiveness is a measure of the severity of the attack. On listening to the chest, sibilant and sonorous rhonci, caused by narrowing of the tubes, and sub-crepitant rhonci from increased secretion, are more or less generally heard; but the resonance of the chest is unimpaired.

As the disease advances, the dyspnœa and cough increase, the face becomes anxious, and the lips and cheeks livid. Various functional derangements from the circulation of imperfectly oxygenated blood are noticed, and still later, should the disease not be checked, the signs of impending death from apnœa. Sibilant rhoncus is very distinct and general over the chest, intermixed with sub-crepitant rhoncus; and in some instances, a small crepitant rhoncus indicates that inflammation has extended to the air cells.

In favourable cases (and they are the most common), from about the fourth to the tenth day, the fever subsides; the dyspnœa becomes less, the expectoration opaque, and mixed with pellets of a yellow or greenish colour; and these changes are followed by the disappearance of the cough and gradual recovery.

When the inflammation extends to the minute or capillary bronchial tubes, the symptoms are from the first very severe, viz. great dyspnœa coming on in paroxysms, constant cough, extreme restlessness, and a very frequent and badly developed pulse; drowsiness, coma, and death are not rarely subsequent events. This form of bronchitis is mostly observed in children.

During the course of bronchitis, especially in children, *collapse of the lung* is apt to occur: by this is understood the emptying of a portion of the lung of its air, whereupon it becomes solid, of a dark red colour, and so heavy, as readily to sink in water. The mode in which collapse occurs in bronchitis, is explained at page 330. We may suspect that it has happened if there should be sudden aggravation of dyspnœa, in which the inspiratory effort is very laborious, with circumscribed dulness in some part of the chest.

In some instances, the first or dry stage of bronchitis is unusually prolonged; or the inflammation may not pass beyond that stage. There is great dyspnœa in paroxysms, with but little cough, and no expectoration; sibilant wheezing rhonci are heard all over the chest.

Sometimes from spasm of the tubes the dyspnœa is so great, that the recumbent posture is unbearable from a feeling of suffocation; and the face is livid and swollen. More or less fever is usually present. These symptoms may continue for several days, when a copious secretion takes place, followed by much relief.

Pathology.—The inflammation in bronchitis is limited to the lining membrane, the secretion from which, at first diminished, is afterwards increased and changed from healthy mucus to a glairy adhesive fluid, which afterwards becomes puriform. Bronchitis is often secondary upon fevers, and is always more or less present in phthisis. In that form of the latter disease in which miliary tubercles are deposited throughout the lung, it is the immediate cause of death.

In fatal cases the lungs do not collapse; the bronchial tubes contain fluid which is often frothy and tinged with blood, and sometimes puriform; the lining membrane is red in patches, and occasionally thickened. It is not uncommon to find circumscribed portions of the lung consolidated, and having the appearance of a piece of flesh (carnification or collapse of the lung). This may be limited to a single lobule, or may involve the whole or greater part of a lobe. It is sometimes the source of danger when the attack of bronchitis is otherwise slight.

Causes.—The most common cause of bronchitis is cold or sudden change of temperature; but it often follows or accompanies fevers. It is said also to be in some way related to erysipelas. Its frequent association with tubercular deposit in the lungs is well known, as is also its occasional occurrence with pneumonia.

Prognosis.—So long as the inflammation is restricted to the large bronchial tubes, the prognosis is favourable; but when the minute or capillary tubes are involved, the danger is great, and especially in children. Even in slight cases, the possibility of pulmonary collapse must be kept in mind.

Treatment.—The more common attacks of bronchitis are best treated by purgatives, antimonial diaphoretics, and turpentine stupes to the chest. When very severe in sthenic persons, leeches or cupping may be used, and the antimony given in somewhat larger doses. In the more advanced stages, and in less sthenic persons from the commencement, ipecacuanha should be substituted for antimony, and combined with nitric and chloric ether, and the compound tincture of camphor; a blister or croton oil liniment must be applied to the chest. Should the skin become cold, and the pulse very feeble, stimulants are to be given—as wine and brandy, and the carbonate of ammonia in doses of from five to eight grains.

The question of administering opium, with the view to allay cough and procure sleep, is one of some nicety. I believe the principle laid down by Dr. Watson to be very sound, viz. that where there is a tendency to death by coma, a full narcotic should not be given; or in other words, it should not be given when there are symptoms of venous blood circulating through the system—as lividity of the lips and duskiness of the face. But when the disease has been somewhat subdued, and the face and lips show no signs of lividity, it is very useful.

Chronic bronchitis.—Chronic bronchitis in a mild form is common in the cold, damp winters of temperate climates, and especially in elderly persons. It is less common in the tropics, but still not unfrequently met with in the monsoon or rainy season.

Symptoms.—The attack may follow acute bronchitis. The fever and more acute symptoms having partially subsided, and the expectoration become opaque, there is not the usual restoration to health: the cough continues and the patient loses flesh; there are imperfectly developed febrile accessions; the pulse is frequent and the appetite impaired. The cough comes on in paroxysms with dyspnœa, and soreness of the chest is often complained of. If these symptoms should continue unchecked, there will be emaciation with diarrhœa, hectic fever, and night sweats. When bronchitis occurs in old feeble individuals, and is attended with much dyspnœa and suffocative cough, from copious secretion into the tubes, it is often called peripneumonia notha, or catarrhus senilis.

The physical signs in chronic bronchitis are mucous and subcrepitant rhonci, without dulness. But when the tubes are dilated, there may be many of the physical signs of a vomica.

Pathology and causes.—The morbid appearances are similar to those of the acute form, except that the redness is less florid or quite absent, and the tubes are more thickened and sometimes dilated. The dilatation may affect the tube in its whole circumference or on one side only, and be confined to a single tube or involve several tubes. Ulceration is rare. Chronic bronchitis is often the result of frequent attacks of the acute form, and is aggravated and excited by cold and changes of temperature. The habitual inhalation of irritating matters in the air, as dust, particles of iron, or of sand, or of porcelain, &c. also causes it. Not unfrequently, it is secondary upon fevers, and is almost always present in disease of the mitral valve, and in emphysema of the lungs and phthisis.

Prognosis.—In its ordinary form, chronic bronchitis is not a fatal disease, though sometimes difficult of cure; but when the inflammation is very general, and the tubes are thickened and dilated, it is almost as serious as phthisis.

Treatment.—The remedies to be employed are stimulating liniments or blisters, and mild tonics and expectorants, as ipecacuanha wine, squills, &c. The iodide of potassium or iron is sometimes useful; and when the expectoration is very profuse, more stimulating expectorants and balsams are indicated, as ammonia, the compound tincture of benzoin, the balsam of copaiba, &c. The inhalation of medicated vapours has in some obstinate cases been of advantage. Opium in various forms will be required to allay cough and procure sleep. The cautions in regard to its use, already stated (page 337), must not be forgotten, and it should be combined with expectorants. When the circulation is very feeble, carbonate of ammonia is often useful. Certain vegetable infusions and decoctions are often employed with advantage, as the decoction of senega, the infusion serpentaria, &c. When there is much spasm, the etherial tincture of lobelia gives relief.

The diet should be nutritious without being stimulating, and much benefit is often derived from gentle exercise in, and frequent change of air.

It is not very uncommon to meet with an affection of the air passages, in which the chief symptom is copious secretion of a thin frothy fluid. There are neither inflammatory symptoms nor fever, but there is in general difficulty of breathing in paroxysms, and urgent cough. These attacks are said to be often associated with derangement of the digestive organs. In the treatment of this affection, which is sometimes called "bronchorrhœa," astringents and tonics are indicated. The sulphate of iron in infusion of roses is recommended by Dr. Watson. The balsams are often useful, and I have prescribed quinine and the tincture of the sesquichloride of iron with good effect.

A peculiar form of bronchitis seems to be produced in certain persons by some subtle emanation from grass that is in flower or has been newly cut down. It is called from its supposed cause "hay asthma." The symptoms stated by Dr. Watson,—for I have never myself seen the disease,—are excessive irritation of the eyes, nose, and the whole of the air passages, producing in succession itching of the eyes and nose, much sneezing, occurring in paroxysms, with a copious defluxion from the nostrils, pricking sensations in the throat, cough, tightness of the chest, and difficulty of breathing, with or without considerable mucous expectoration. Somewhat similar symptoms are occasionally produced by the dust of ipecacuanha. Hay asthma is in no way dangerous. The best remedy is to remove from the cause of it. Should this not be possible, it may be relieved by quinine and iron or arsenic.

Bronchial polypi.—It sometimes happens, perhaps as the effect of chronic inflammation, that lymph is effused into the smaller bronchial tubes, and coagulating, is accurately moulded to them. Separating from the lining membrane and becoming loose, it is coughed up in masses which have been compared to bunches of worms or the roots of a small plant. Before these were expectorated, in the few instances that have been recorded, there were violent fits of coughing and much dyspnœa, and in some cases hæmoptysis. Of the condition of the air passages in these cases we know nothing, as this disease has never been fatal.

ASTHMA.—*Paroxysms of dyspnœa, caused by spasmodic contraction of the bronchial tubes.*

Under the designation "asthma," attacks of dyspnœa, howsoever induced, have often been erroneously classed. Thus the dyspnœa from bronchitis, congestion of the lungs in disease of the heart, pulmonary œdema, &c. have often been recorded as asthma. This has led to much confusion. It is proposed to restrict "asthma" to dyspnœa, which is essentially caused by spasmodic contraction; this, it is true, may be, and often is, associated with inflammation and other derangements, but it not unfrequently exists independently of them.

Symptoms.—An attack of asthma is sometimes preceded for several hours or a few days by languor, distension of the stomach, drowsiness, headache, and a sense of constriction across the lower part of the chest; but as often its advent is quite sudden. Many persons are attacked in the night, and are awoke from their sleep. The first feeling is a sense of suffocation, which causes the patient to start up from his bed, and rush to the window to procure air. The muscles of inspiration are thrown into violent action. The following description is given of the paroxysm by one who often witnessed it, and was himself the subject of the disease :—

" When once the paroxysm is established, the asthmatic offers a very striking and very distressing spectacle. If he moves at all, it is with great difficulty, creeping by stages from one piece of furniture to another. But most commonly he sits fixed in a chair, immovable, unable to speak, or even perhaps to move his head in answer to questions that may be put to him. His back is rounded, and his gait stooping, indeed, his whole figure is deformed. His chest, back, shoulders, and head are fixed ; he cannot even turn his head from side to side, but when he looks from object to object, merely turns his eyes, like a person with a stiff neck ; his shoulders are raised to his ears, and his head thrown back and buried between them. At every breath his head is thrown back, his shoulders still more raised, his mouth a little opened, with a gasping movement, his expression is anxious and distressed, the eyes are wide open, sometimes strained, turgid, and suffused ; his face is pallid, and if the dyspnœa is extreme and long, slightly cyanotic ; the labour of breathing is such that beads of perspiration stand on his forehead, or even run in drops down his face, which his attendant has constantly to wipe. If the bronchial spasm is protracted and intense, the heat of the body falls. I have known the whole body deathly cold, and resist all efforts to warm it."

The pulse is often small and weak, but may be little changed, the face is either pale or flushed, and the skin covered with cold sweat. On listening to the chest, little or no respiratory murmur can be heard.

The attack may pass off in a few minutes, and is seldom prolonged for more than three or four hours. Its subsidence, which is gradual, is often coincident with profuse secretion from the bronchial tubes. During the following day the patient may be tolerably easy, with the exception of soreness of the chest, wheezing, and slight dyspnœa, especially on making any exertion, but at night he is liable to have another paroxysm, and this may be repeated several times, each paroxysm becoming less and less severe until the attack altogether ceases for a time.

Although the paroxysms sometimes recur ar regular periods, they are often quite irregular in their accession. The interval between the attacks is also subject to much variety.

Pathology.—Asthma is now generally admitted to be essentially a nervous disease, the effect of which is contraction (spastic) of the muscular fibre of the small bronchial tubes, whereby the entrance of air is prevented. It is believed, that in many instances from irritation at the periphery, impressions are conveyed by nervous fibres to a nervous centre, and there transferred to efferent nerves which are distributed to the muscular tissue of the bronchial tubes.

The nerve which is implicated is usually the pneumogastric, but sometimes other nerves are also involved, and occasionally the source of irritation is central, in the brain.

The most common source of irritation is in the stomach, viz. indigestible or too much food; but irritant matters in any part of the intestinal canal, especially in the rectum, sometimes cause an attack; and at times irritation of the skin even, as the sudden application of cold, will be sufficient. But the stimulus may be still more directly applied, as when cold air, ipecacuanha powder, the emanations from flowering or newly-cut grass, are inhaled. Attacks of asthma which appear to have a central origin, are often connected with mental states. Asthma may occur at any period of life, from infancy to old age, and it is often associated with bronchitis and emphysema of the lungs. When uncomplicated, it may continue for a long time without affecting the health, and in some instances it does not appear to shorten life. But more frequently, it leads to serious secondary derangements. Thus, the right side of the heart becomes dilated from obstruction to the circulation through the lungs; and from impediment to the passage of air during expiration, emphysema is produced.

Morbid appearances.—There are no morbid appearances which are essential to spasmodic asthma, but as uncomplicated asthma is rarely or never fatal, appearances of disease in the organs, which are secondarily affected, are generally found after death.

Causes.—There must be a predisposition which renders the mucous membrane of the bronchial tubes and the branches of the pneumogastric and other nerves susceptible of the action of the exciting causes; but the nature of such predisposition is not apparent. There is reason to believe that it may be hereditary, or connected with hysteria, and the rheumatic and gouty diathesis, and some have thought that it may be due to states of exhaustion however induced. Sex and age seem to give a predisposition: asthma is more common in men than women, and in middle age. It is rare in young children, and seldom occurs for the first time in old persons.

The exciting causes are very various. The most common is an over-loaded or distended stomach, and next to this, cold and sudden change of temperature. Irritant particles and vapours in the atmosphere often produce an attack. But there are individual susceptibilities which are very peculiar, and in which, states of the atmosphere altogether unknown act as exciting causes. Many persons are quite well in the smoky atmosphere of a large town, but suffer on breathing the pure air of the country; others cannot breathe in a town, but are quite cured by the bracing country air. Some suffer in the lower rooms of a house, but are well in the upper. Dry air suits some asthmatics best, whilst others are benefited by moist air.

The mind has without doubt much influence in bringing on an attack; the fear of a paroxysm has been known to induce it.

Some of the alleged causes do not admit of any explanation, as for example, the shutting of a door, the change in the direction of a journey, the change from one room to another, the air of which is not different, &c.

From the periodicity, sometimes exhibited by attacks of asthma in tropical countries, it has been thought that malaria may be a cause.

Treatment.—The treatment of asthma has reference to the paroxysm, and the interval between the attacks. For the relief of the paroxysm, two principles are to be kept in view:—1*st*, to remove the cause; 2*nd*, to allay the spasm.

As one of the most common exciting causes is an overloaded state of the stomach or of the rectum, an emetic and enema should be administered. If there is reason to believe that there is any irritant in the air the patient is breathing, as ipecacuanha powder, the emanations from a hay field, &c. he should be at once removed. The patient should seat himself in a chair, with a table of suitable height in front of him on which he can lean.

The cause having as far as possible been removed, spasm should be allayed by depressants; of these ipecacuanha, antimony, and tobacco are the most efficacious. The former may be given in doses of twenty grains, and often relieves before there is vomiting. Antimony, in doses of from one grain to three, is very successful. But for those who are not habituated to smoking, there is said to be no remedy so speedy and effectual in its operation as tobacco smoked through a pipe. Relief is sometimes experienced from smoking stramonium, and from inhaling the fumes of burning paper which has been dipped in a saturated solution of nitrate of potass.* The lobelia inflata has sometimes been of service, though it often fails. Strong coffee, in small quantities, without milk or sugar, is often serviceable. Chloroform, cautiously administered, has been at times very successful.

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* The paper should be moderately thick and loose in texture, and the solution saturated at the ordinary temperature. Red blotting paper is said to be the best. A piece about 4 inches square should be burnt in the bed-room when the patient retires to rest.

The treatment in the intervals has reference to removal of the patient permanently from what appears to be the cause of the attack, careful regulation of the diet, and the cure of any derangement that may be present. The stomach should never be overloaded; the principal meal should be taken some hours before retiring to rest, and the food should be plain and easily digestible. Great care should be used to find out those articles of food which appear to bring on an attack, in order that they may be abstained from. Dyspeptic symptoms must be treated as they occur, and the bowels and secretions duly regulated.

PERTUSSIS.—*Hooping-cough.—A contagious disease, of which paroxysmal cough is the prominent symptom.*

Hooping-cough is met with in most parts of the world, and like the exanthemata, is peculiar in the circumstance, that one attack usually protects a person from a second attack. As most children are susceptible of the cause of hooping-cough, and few escape an attack, it is rarely seen in adults.

Symptoms.—Three stages may generally be recognised, but which are not always distinct, one or other being curtailed.

1*st stage.*—In the first stage, which commences after an incubation of about six days, and lasts from one to two weeks, there is paroxysmal cough and slight catarrhal and febrile symptoms. As the fever subsides, the cough assumes a peculiar character, by which the commencement of the second stage is determined.

2*nd stage.*—In the second stage, the disease is fully established. The cough is then more decidedly paroxysmal, occurs at irregular intervals both during the day and night, and is of a convulsive, ringing character. It consists of numerous short, forcible expirations, following each other with such extreme rapidity, that inspiration is for the time suspended. No air enters the chest; the child seizes some object for support, stamps on the ground, or even struggles violently; the face becomes swollen and livid, the eyes prominent and blood-shot, the veins of the neck swollen; and, indeed, there is every appearance of impending suffocation. In very severe attacks, the urine and fæces are passed involuntarily. At length there is a long, slow, and deep inspiration, attended with a crowing, stridulous, or hooping sound, which has given the name "hooping" to the disease. This is almost immediately followed by a recurrence of the cough, which continues as before, ending in the hooping inspiration. And these attacks are repeated until the child coughs up a little glairy mucus or vomits; or what is more common, does both. The paroxysm, which lasts from half a minute to several minutes, is then over; the child plays about as usual, and is to appearance well. But several or many times in the day and night the paroxysm returns.

When hooping cough is uncomplicated, there may be few or no symptoms beyond the cough just described; but not unfrequently it is complicated with bronchitis, collapse of the lung, and convulsions; and then, of course, there will be the symptoms of those diseases, under which the child may die. In the 3rd stage, the disease gradually declines, the paroxysms become less frequent, the expectoration increases in quantity and becomes opaque, and the hooping character of the cough disappears. Three months are often assigned as the duration of hooping cough, viz. six weeks for its formation, two or three during which it is at its height, and three or four for its decline.

Pathology.—The pathology of hooping cough, like the pathology of other spasmodic diseases, is obscure. That the cough is mainly due to spasmodic contraction of the muscles of respiration and of the larynx is certain, but the *cause* of such contraction is not apparent. Some have thought that there is central nervous disease, whereby motor impulses in excess are produced, and transmitted to the respiratory and other muscles; but of this there is not sufficient evidence. Others, with more reason, think that there is peripheral irritation, leading to reflex action. The source of this irritation is doubtful: some have ascribed it to slight inflammation of the mucous lining of the air passages; others believe that it may not unfrequently be traced to enlargement of the lymphatic glands in the neck; whilst others again attribute it to a poison having been brought into relation with the mucous membrane. One curious circumstance in connection with hooping cough is, that the urine contains sugar. In fatal cases there are no morbid appearances to explain the spasm, and those that are present have reference to the particular complication which has caused death. Not unfrequently, when there is bronchitis, portions of the lung are collapsed, and redness of the lining membrane is commonly observed.

Diagnosis.—When the disease is fully formed, there is no difficulty in the diagnosis, the cough being unlike that in any other disease. In the beginning, when there are merely catarrhal symptoms, the nature of the attack may be suspected from the paroxysmal character of the cough, and the fact of hooping cough being prevalent at the time.

Causes.—There is no question of the contagious nature of hooping cough; but like most contagious diseases, it is influenced by epidemic causes. Some epidemics are much more fatal than others.

Prognosis.—In uncomplicated cases, the prognosis is favourable; but as serious complications are liable to occur, the disease should be carefully watched, and an opinion given with caution as to the certainty of recovery.

Treatment.—As there is no specific remedy for hooping cough, and as the disease will run a course which cannot be cut short, the principles of treatment should be restricted to the following:—1, to prevent complications; 2, to allay the violence of the cough; 3, to maintain the general health.

In the early stage the diet should be restricted, the child warmly clothed, and the bowels acted upon by a moderately active aperient. Whilst fever continues, diaphoretics may be used.

When spasmodic cough has fairly set in, should fever continue, small doses of ipecacuanha wine, combined or not with morphia or syrup of poppies, are to be given, and in severe cases, an emetic dose of the former may be prescribed. Should there be no fever, antispasmodics may be tried, as assafœtida, valerian, musk, &c. Belladonna has been highly praised, but it should be given with extreme caution, and the same remark applies to hydrocyanic acid. A belladonna plaster has been useful, but it is a very potent and even dangerous remedy. Frictions on the chest with a stimulating embrocation, or the application of a sinapism, are better adapted to the majority of cases. In the 3rd stage tonics should be given, and of these the oxide of zinc, the preparations of iron, and the disulphate of quinine are the best. When complications occur, they must be treated in the manner described under the diseases which constitute them. The complication which is most to be apprehended, and which is most fatal, is capillary bronchitis and collapse of the lung. Stimulants and nourishment are the remedies then indicated.

CYNANCHE TRACHEALIS.—CROUP.—*Inflammation of the mucous membrane of some part of the air passages, with spasm of the glottis and exudation of lymph.*

Croup is a disease of childhood; it prevails most between the second and sixth year of age, and rarely occurs after puberty or in infancy. It is common in Europe, and European children in all parts of the world suffer from it; but I have never met with nor heard of croup in a Native child in India, and it may without hesitation be affirmed, that Native children in Bombay are quite exempt from this disease. Croup occurs in a *severe* and a *mild* form.

Symptoms in the severe form.—The attack may be sudden, but is usually preceded by catarrhal symptoms, which at first cannot be distinguished from the symptoms of ordinary catarrh. It is soon noticed, however, that the child is hoarse, and that when it cries, a peculiar harsh, croaking sound is produced, or it may be that there is a loud, rough, and ringing cough. In some cases, after being affected for a day or two with catarrhal symptoms, the child wakes from its sleep, starts up as if suffocated, and begins to cough. The peculiarity of the cough does not admit of accurate description; once heard, it can never be forgotten. It is loud, harsh, and ringing, and has been compared to the sound produced by "coughing through a brazen trumpet." When the disease is fairly established, it comes on in paroxysms, and is followed by a loud, crowing inspiration; the breathing is difficult, the pulse frequent, the skin hot, and the face flushed.

Progress.—In unfavourable cases, the paroxysms of cough and dyspnœa become more frequent, and the breathing is wheezing and difficult even between the paroxysms. There is much restlessness, and the child has much thirst; at a later period, the larynx and trachea are tender to the touch, the breathing is greatly embarrassed, and during the paroxysms the face is livid, the eyes prominent, and the veins distended; in short, there are all the signs of apnœa. In one of these paroxysms, the child may suddenly die; but more frequently, from imperfectly oxygenated blood circulating through the vessels, drowsiness sets in, followed by coma and death.

In some instances, the symptoms are more related to an embarrassed state of the heart, than to obstruction of the air passages. Thus, the face may be pale in place of swollen and livid, the extremities cold, the pulse and heart-beat feeble and irregular. These symptoms are with much reason thought to depend upon fibrinous coagula in the heart.

In a mild form, or when treated in the early stage, the cough diminishes in severity, the dyspnœa ceases, and the fever subsides.

It should be noticed, that croup often occurs in the night; whenever, therefore, a child has catarrhal symptoms, with hoarseness or a brassy-ringing cough, it should be carefully watched, and the medical attendant would do well to be within easy reach.

In the mild form of croup, there are paroxysms of the peculiar cough, without febrile disturbance, the child being comparatively well between them. This may happen at intervals for several days, and by care in protecting the child from cold and sudden changes of temperature, the attack may subside. If neglected, it may pass into the severe form. In fatal cases of croup, the larynx, trachea, and even the bronchial tubes are found to contain fibrinous exudations, whereby the tubes are more or less obstructed. The exudations may exist as a thin layer, or be so copious, as to form casts of the tubes, which sometimes separate from the lining membrane, and are coughed up. They may be limited to the larynx or trachea, or extend into the minute bronchial tubes. No doubt the difficulty of breathing is in part due to the obstruction caused by these exudations, but the paroxysms of dyspnœa are the result of spasmodic contraction of the rima glottidis. The exudations are said never to become organized, differing in this respect from the plastic effusions upon serous membranes. The spasm of the glottis is no doubt the result of reflex action, the excito-motor impressions being due to the inflamed mucous membrane.

Croup is not unfrequently complicated with bronchitis and pneumonia.

Causes of croup.—Croup is usually attributed to cold and alternations of temperature, and no doubt these are the common exciting causes. But there must be predisposing causes: age seems to give a predisposition to the disease, as it seldom occurs except during childhood. But the fact that Native children do not suffer from croup in Bombay, nor perhaps in other parts of tropical India, whilst resident European children are frequently attacked, sufficiently shows that there must be other predisposing causes. Of the nature of these we are altogether ignorant.

Diagnosis.—The diagnosis of croup from laryngitis and laryngismus stridulus,—the only diseases with which it is liable to be confounded,—will be explained under those affections.

Prognosis.—Croup is a very serious disease; about one half of those attacked by it die. However mild it may at first appear, a very guarded prognosis should be given. When from the persisting dyspnœa there is reason to believe that exudations are collecting in the air passages, there is but little chance of recovery. The signs of fibrinous coagula in the heart denote a fatal termination in the greater number of instances.

Treatment.—There is no disease in which early and decided treatment is more required than in croup. Upon the first appearance of a paroxysm of brassy, ringing cough, an emetic should be given, and a warm bath used; the bowels should be freely acted upon by aperient medicine, and afterwards diaphoretics given, and the child confined to a warm room.

In the more severe and urgent form, still more active measures are necessary. Nausea and vomiting should be excited and kept up by tartar emetic: a grain of this medicine may be dissolved in an ounce of water, and a tea spoonful given every quarter of an hour, until a marked effect is produced. Leeches should be applied over the sternum, and calomel combined with a purgative administered. Afterwards, ipecacuanha may be substituted for the antimony, and counter-irritation used to the neck. A very efficient mode of using counter-irritation in children is recommended by Dr. Williams: a piece of lint, dipped in strong liquor ammonia, is to be applied to the neck for two minutes, and covered with a pill box or wine glass. Clusters of small vesicles are almost immediately produced.

After emetics have been freely given, should the disease not be subdued, calomel in doses of two or three grains may be administered every three or four hours, until spinach-looking stools are produced; or half a drachm of the blue ointment may be rubbed as often upon the insides of the thighs. In the advanced stages stimulants must be given. The chlorate of potash has been used with advantage.

Supposing the dyspnœa to be so great as to endanger life, should the air passage be opened? This question has been much discussed. The fibrinous exudations, reaching as they often do low down in the bronchial tubes, have been considered a fatal objection to the practice, but it is possible exudation may not exist even when the dyspnœa is very great. There is room for selection. If the dyspnœa is paroxysmal, and the breathing not very difficult in the intervals, and on listening to the chest, air is found to enter when the paroxysm is not present, tracheotomy may be performed; but if the dyspnœa, though increased in paroxysms, is always more or less present, or if there are signs of fibrinous coagula in the heart, it should not be attempted.

LARYNGITIS.—*Inflammation of the lining membrane of the Larynx.*

Slight inflammation of the larynx is often present in simple catarrh, and is, perhaps, seldom absent when the latter is accompanied by hoarseness of voice. The more severe form of laryngitis, which is now to be described, is a less frequent, but much more serious disease.

ACUTE LARYNGITIS.—Acute laryngitis, though not very uncommon in Europe, is certainly rare in India.

Symptoms.—The first symptom usually noticed, is soreness of the throat, and on looking into the fauces, the velum and uvula appear red and swollen, and by pressing the tongue down, the epiglottis may be seen erect and tumid. Difficulty of swallowing soon comes on, and food and drink are apt to pass into the chink of the glottis, causing violent fits of cough and dyspnœa. As the disease makes progress, the patient becomes anxious and restless, with difficult respiration, accompanied by wheezing, which is evidently in the throat and not in the chest; and on listening to the latter, the respiratory murmur is very imperfectly heard. The dyspnœa is greatly increased in paroxysms. There is cough, which is harsh and stridulous, or husky and feeble. The voice is hoarse or altogether absent; the patient speaking in a whisper. The *pomum adami* is pointed to as the seat of the suffering, and on making pressure there, tenderness is complained of. Besides the local symptoms, there is in general much fever, the face is flushed, and the pulse frequent and often hard. In the advanced stage, symptoms of apnœa set in, of which lividity of the face, violent action of the respiratory muscles, rapid movement of the larynx and trachea, and ultimately drowsiness and delirium are the chief.

Pathology.—Laryngitis is inflammation of the lining membrane of the larynx, and often of limited extent. The danger mainly arises from its proximity to the rima glottidis, and the tendency to œdema or exudation. The last is probably dependent upon hyper-fibrinosis of the blood. In fatal cases, the lining membrane is found swollen and turgid, and sometimes covered with flakes of lymph. The edges of the glottis, especially in asthenic persons, are often swollen and œdematous, whereby the aperture is narrowed, and the entrance of air impeded. No doubt during life the opening is still further diminished by spasm.

Causes.—Laryngitis is usually due to the ordinary causes of inflammation, as exposure to cold, &c.; but it is sometimes produced by swallowing irritating or corrosive fluids, as boiling water, the strong mineral acids, &c. The inhalation of irritant gases has also caused it, and so has mechanical injury. Not unfrequently, inflammation from neighbouring parts extends to the larynx, and sometimes laryngitis is secondary upon other diseases—as fevers, erysipelas, &c.

Diagnosis and prognosis.—From disease limited to the throat, laryngitis may be distinguished by the paroxysmal difficulty of breathing, the hoarseness of voice, and the peculiar cough. In many respects it resembles croup; but *that* is a disease of childhood, *this* of adult life. The difficulty of swallowing is also less in croup, and the erect and tumid state of the epiglottis is not observed in that disease.

But there is much greater risk of mistaking aneurism of the thoracic aorta for laryngitis. The pressure of an aneurismal tumor upon the lower part of the air passages, or upon the nerves, has sometimes led to symptoms almost exactly resembling laryngitis. The history of the attack, the absence of fever, and the physical examination of the chest, should, in most instances, be sufficient to enable a correct diagnosis to be made. The prognosis in laryngitis should be very guarded, the greater number of persons attacked with it having died.

Treatment.—In the very early stage in sthenic persons, when the skin is hot, and the pulse full and firm, venesection should be performed; at a later period, and in asthenic persons from the commencement, when the pulse is feeble, or the skin dusky or livid, this is contra-indicated. In such cases, blood may be abstracted locally, by cupping the back part of the neck; but for the most part it is better not to take blood at all. The bowels should be freely acted upon by a mercurial purgative, and calomel, with small doses of antimony or ipecacuanha, given every two or three hours, and a blister applied to the upper part of the sternum. Care must be taken not to give the antimony or ipecacuanha in such doses as to cause vomiting, lest the vomited matters, owing to the condition of the epiglottis, pass into the rima glottidis, and cause serious dyspnœa.

Should these measures not be followed by amendment, and should there be evidence of imperfectly oxygenated blood circulating through the vessels, the air passage below the vocal chords should be at once opened. It is important that the operation should not be too long delayed, and the time just stated, viz. when imperfectly oxygenated blood is beginning to circulate through the vessels, is that which ought to be selected. But however advanced the disease may be, the operation should still be performed, as it has been successful in cases which seemed altogether desperate, and even if it should not save life, it will afford some relief.

Chronic laryngitis.—The larynx is liable to chronic inflammation and ulceration, which destroys the mucous membrane and causes necrosis of the cartilages. This is often associated with phthisis or syphilis. At first there is hoarseness, and afterwards loss of voice and stridulous cough. In syphilis, when ulceration is often extensive, cough becomes very urgent, with puriform and bloody expectoration; the breathing is difficult and stridulous, and sometimes the attacks of dyspnœa are so severe, as to threaten suffocation. The larynx is tender on being handled, and the patient becomes emaciated, and has hectic accessions of fever.

In the treatment of chronic laryngitis, we must trust to moderate leeching and counter-irritation, mercury, the preparations of iodine, &c. The strength must be supported by a nutritious diet. Benefit is sometimes derived from mopping the inside of the larynx with a strong solution of the nitrate of silver. This may be done by means of a sponge fixed to the end of a probang. When the attacks of dyspnœa become so severe as to endanger life, the larynx or trachea should be opened. This operation, under such circumstances, is attended with great relief, and the quietude of the rima glottidis which follows it, is favourable to the healing of the ulcers.

Œdema of the glottis.—Œdema of the glottis is a dangerous accompaniment of severe inflammations of the larynx; but in asthenic persons it sometimes occurs when the inflammation is very slight, or, indeed, when there is scarcely any inflammation. The only effectual remedy is laryngotomy or tracheotomy.

Other diseases of the larynx.—Malignant disease is sometimes met with, and polypi or warty growths in different parts of the larynx are occasionally found after death. Great light has of late been thrown upon the diagnosis of the more obscure diseases of the larynx, by the use of the laryngoscope.

LARYNGISMUS STRIDULUS.—*Spasmodic Croup. Crowing disease. Spasmodic closure of the Glottis without imflammation.*

In infants, usually during the first dentition, the glottis is liable to be suddenly closed by spasm. The attack often occurs during sleep, from which the child is awoke in great alarm. The most violent but ineffectual efforts are made to breathe, until there are many of the signs of impending death by apnœa, which, indeed, sometimes *does* occur, from the continuance of the spasm. More frequently, however, at the moment when this might be apprehended, the spasm relaxes and a deep inspiration is taken, with a loud whooping, stridulous noise. The fingers and toes are often noticed to be contracted, and the attack is sometimes followed by convulsions. There is an entire absence of fever, and of any appearance of disease of the chest.

The severity of the disease varies: the paroxysm may be slight, or so severe, that the child has been known to die in the first attack; but sometimes the danger seems to depend less upon the severity than upon the frequency of the attacks.

There is little doubt that the spasm is caused by reflex action. The source of the excito-motor impressions may be an inflamed gum during dentition, enlargement of the lymphatic glands of the neck, or irritating matters in the intestinal canal. The nerves affected, are the trifacial in the former case and pneumo-gastric in the latter.

In children who breathe impure air and are badly nourished, a state of morbid excitability of the nervous system is sometimes induced, wherein very slight causes are sufficient to excite the spasm, as for example, a current of cold air, the act of swallowing, &c.

Treatment.—During the paroxysm, attempts should be made to excite inspiration, by sprinkling the face with cold water, slapping the chest and nates, and taking the child into a current of cold air. Ether or ammonia may be applied to the nostrils, and artificial respiration attempted, or even tracheotomy or laryngotomy performed.

To prevent the attacks, the cause must be sought for, and if possible removed. The gums must be lanced should the teeth be pressing upon them, and purgatives must be given if there are irritating matters in the intestines. Care should be taken that the child's stomach is not overloaded. When the attacks are very frequent, they may sometimes be prevented, by keeping the little patient slightly under the influence of opium, but much caution is necessary in using this remedy.

DISEASES OF THE THROAT.

Inflammation of the mucous membrane of the soft palate, uvula, and tonsils is of common occurrence, but of little importance in most instances. Sometimes, however, it is associated with serious diseases, to the danger of which it materially adds. Angina and cynanche are the terms used to designate inflammation of the throat; the former will be employed in this work.

Angina diffusa.—This is the mildest form of angina, and is familiarly known as "sore throat." The mucous membrane of the parts, seen on looking into the fauces, is reddened, and the uvula and tonsils are swollen. There is complaint of soreness, dryness, and of pain in swallowing; the articulation is thick and indistinct, and there is partial deafness from obstruction of the orifice of the Eustachian tube. In severe attacks there may be febrile disturbance. Restriction of the diet for a day or two, a warm pediluvium at bed time, a mild aperient, and protection of the throat from cold, by wearing a piece of flannel round it, will be sufficient in most instances for the cure of this slight affection; but should there be much pain or tenderness, and fever, a few leeches may be applied, antimonials and salines given, and a warm water gargle used. In cold countries, inflammation of the tonsils often runs on to suppuration, causing what is commonly known as "quinsey," but this seldom happens in the tropics. Whilst matter is forming, pain and difficulty of swallowing are very distressing; the tonsils become much swollen, and at length fluctuation can be detected. The throat should be steamed, by holding the face over a basin filled with hot water, a towel being thrown over both the head and the basin. Fomentation and linseed poultices may be applied to the throat externally, and when fluctuation is distinct, the abscess should be opened.

Inflammation of the throat sometimes becomes chronic: there is then swelling and very often a relaxed state of the mucous membrane. Stimulating gargles should be used, and a solution of the nitrate of silver applied.

In consequence of repeated attacks of angina, the uvula and tonsils are permanently thickened; deglutition is rendered painful and difficult, and troublesome cough excited and kept up. If the swelling cannot be reduced by stimulating gargles, nitrate of silver, and iodine, it may be necessary to cut off the redundant portions.

Angina membranacea. — *Diphtheria. Diphtheritis. A febrile disease, accompanied by inflammation of the throat, in which there are fibrinous exudations upon the surface of the mucous membrane.*

Diphtheria has probably prevailed more or less in various parts of the world for many centuries, but it did not excite much attention until within the last twenty or thirty years. It is, I believe, rare in India, and has never, to my knowledge, occurred as an epidemic.

Symptoms.—In severe cases, the attack sets in with chills and vomiting, followed by fever of a low type. Attention is early directed to the throat, on account of pain being felt there, and difficulty in swallowing. The fauces are red and swollen, and white patches are seen upon the tonsils or soft palate, which are due to fibrinous exudation. This rapidly spreads, increases in thickness, and is firmly attached to the membrane on which it lies, so as only to be removed with difficulty. The exudation in time covers all the parts in the throat, and may still further extend into the mouth and nose, and into the pharynx and larynx. When separated from the membrane, no breach of texture is necessarily observed, though ulceration and gangrene *may* sometimes occur. As the exudation increases, the salivary and lymphatic glands of the neck become swollen, as does also, in some cases, the whole of the neck.

Progress.—The pain and difficulty in swallowing increase, and not unfrequently there is croupy breathing from exudation into the larynx; the breath is horribly fetid, and deglutition so painful and difficult, that liquids are ejected through the nose. The general symptoms, in severe cases, are those of adynamic fever, often associated with the signs of apnœa. In some instances the latter predominate. Hæmorrhage from the nose or throat sometimes takes place, and the skin is marked by spots resembling purpura. Albumen and fibrinous casts are found in the urine. The mode of death varies: it may occur in a few hours from apnœa, or at a later period from exhaustion; sometimes it happens somewhat suddenly under symptoms of collapse, when, it is said, fibrinous coagula are found in the heart.

In slight cases, the exudation separates from the mucous membrane, and the disease is stayed.

The duration of diphtheria is from a few hours to two or three weeks. When it proves fatal in the latter period, death is often from exhaustion, but not unfrequently from the supervention of some other affection: paralysis of the muscles of deglutition, and even hemiplegia have been observed.

Pathology and causes.—In fatal cases, the lining membrane of the fauces and air passage is found to be covered with ash-colored exudation, which, in some instances, reaches into the bronchial tubes. The membrane beneath is rarely ulcerated. The neck is swollen from infiltration with fibro-serous fluid or sanious pus; and from enlargement of the lymphatic glands. Sometimes the cervical portion of the spinal cord presents the appearances of inflammation, which may account for the paralysis occasionally noticed. The nature of the exudation has been carefully examined: it consists of fibrils, corpuscules, and parasitic fungi; but it is doubtful if the latter are peculiar to this affection.

Upon the nature of diphtheria there has been much speculation: some view it as simple inflammation, modified by its occurrence in persons whose general health has been vitiated by exposure to adverse sanitary influences; others look upon it as a variety of croup; whilst many good observers believe it to be connected in some way with scarlet fever. The latter view has much in its favour: scarlet fever has usually prevailed in those places where diphtheria has occurred. During a severe epidemic of scarlet fever, which raged in the southern part of Australia in the year 1853, diphtheria was very prevalent and fatal; and, indeed, in some of the cases which I saw, it was difficult to say which of those diseases was present; a careful examination of the exudation and of the mucous membrane beneath would doubtless have cleared up the difficulty. Until scarlet fever was introduced into Australia, it had never occurred. In the Western Presidency of India, where scarlet fever does not prevail, diphtheria in an epidemic form is quite unknown.

Whilst we must confess our ignorance of the essential conditions which are necessary for the production of diphtheria, it is beyond question, that the severity of the disease is influenced by defective sanitary arrangements. That it sometimes spreads by contagion is probable; but there is not sufficient evidence to prove that it can be conveyed by fomites, in the way that small-pox, scarlet fever, &c. are conveyed.

Treatment.—It is now well ascertained, that depletion is not well borne in this disease; on the contrary, the indication is rather to support the strength: small doses of quinine, with the tincture of the sesquichloride of iron, or the chlorate of potass, are perhaps the best tonic medicines. Milk, chicken or mutton broth should be given as diet, and wine or brandy used.

Local applications are not of much service, and if too energetic may do harm. At first the throat may be gargled with a solution of borax, or of tincture of iron; or a solution of the nitrate of silver may be applied. Afterwards, when there is much fetor, a disinfectant gargle should be eimployed. No attempt is to be made to tear away the exudation from the membrane, and powerful escharotics should not be had recourse to.

DISEASES OF THE MOUTH.

STOMATITIS.—*Inflammation of the mucous membrane of the mouth.*—Inflammation of the mucous membrane of the mouth appears as white points or streaks, either distinct or joined together in patches, and which are known as "aphthæ." They may be vesicles, enlarged mucous follicles, altered epithelial cells, or altered secretion.

The mildest form, viz. that in which the secretion is altered, called "thrush," is common in infants of a few weeks old, and caused by the milk being unsuitable. A little borax and honey should be applied to the spots, and any general derangement that may be present remedied. If this is not sufficient, the child's nurse must be changed. The follicular variety occurs about the time of the first dentition, and is ushered in with slight febrile symptoms. It appears as little prominences, often on the tongue and soft palate, and which sometimes are converted into circular ulcers. The bowels should be gently acted upon by an aperient, and magnesia or soda given to correct acidity. If there is much fever, diaphoretics are to be prescribed. Borax and honey may be at first applied, but when ulcers have formed, astringent and stimulating lotions—as of alum, sulphate of zinc, or nitrate of silver—are to be used.

Follicular aphthæ in patches (confluent) are often observed in the last stages of exhausting diseases, as phthisis, cancer, &c. Vesicular aphthæ are met with in the adult, and often associated with gastric irritation. They appear as vesicles which soon burst, and leave small ulcers. So long as they are distinct the affection is slight, but sometimes the vesicles are grouped or confluent, and extend to the pharynx, causing pain in swallowing, and much febrile disturbance. The treatment is the same as that for the follicular variety.

Those forms of aphthæ, which appear to arise from change in the secretion, are in some instances at least the development of one or more parasitic plants, which have been identified. A solution of the sulphite of soda is said to be a certain cure in such cases.

Stomatitis ulcerosa.—*Cancrum oris.*—This is an ulcerative disease affecting the gums. It begins as a small ulcer, which soon spreads, in the gums of the incisor teeth. Its surface is ash-coloured, whilst the edges are red and well defined. The surrounding part of the gum is swollen and inflamed, and the swelling may extend to the whole mouth or even to the glands of the neck. The flow of saliva is much increased. As the ulcer extends, the gums are destroyed, the teeth become loose and drop out, the alveoli are exposed, and often exfoliate. Sometimes the ulceration involves the tongue and cheeks, and the patient may sink from irritative fever and exhaustion, but this is rare: under proper treatment, it in most cases is checked. The subjects of this affection are weakly children, who are insufficiently nourished.

The chlorate of potass has great efficacy in this disease, and when combined with tonics, a suitable diet, and the occasional application of the solution of the nitrate of silver, will in general effect a cure.

Gangrœna oris.—*Sloughing phagedœna of the Mouth.*

This very serious disease generally occurs in weakly, anæmic children, and appears as an ash-coloured slough upon the centre of the inner surface of the cheek, which is swollen and tense. The slough increases in size, extends to the gums, and involves the whole of the cheek, which is not unfrequently perforated.

Much constitutional disturbance, *i. e.* irritative fever, sets in, and the child sinks from exhaustion. For a more full description, and for the treatment of gangrœna oris, the student is referred to works on Surgery.

Glossitis.—*Inflammation of the tongue.*—Inflammation of the tongue follows injury and certain diseases of that organ, and is often attended by so much swelling, that mastication, swallowing, and respiration are interfered with. Occasionally it occurs as an idiopathic affection, and for the most part in asthenic persons. The tongue is swollen, hot, and painful, and there is more or less febrile disturbance. The swelling may be such, that the tongue protrudes between the teeth.

When respiration is interfered with, very decided treatment is required: incisions should be made, or the nitrate of silver freely applied. Derivation should be induced by purgative enemata.

Cynanche parotidea. *Mumps.*—This is a slight inflammation of the salivary glands, especially the parotid, accompanied by fever, which is peculiar, in being contagious. It is remarkable that the inflammation never leads to suppuration. The disease is at its height in 4 or 5 days, from which time it declines. Occasionally the inflammation leaves the salivary glands, and by metastasis is set up in the mamma or testicle.

Scarcely any treatment is required, the attack usually subsiding of itself within the time stated. In the more severe cases, a mild laxative and diaphoretics may be given.

Disease of the œsophagus.—The canal of the œsophagus may be narrowed by the pressure of tumours, &c. Thickening of its coats, leading to stricture, may be caused by swallowing corrosive or irritating fluids, and occasionally, though rarely, either as the result of a low form of inflammation, or from cancerous and other deposit. When the stricture is such as to interfere with the passage of food, an attempt to dilate it should be cautiously made by the passage of a probang, or the tube of a stomach pump.

Hysterical women, and sometimes other persons, are occasionally affected with spasmodic stricture of the œsophagus, which is made known by sudden difficulty in swallowing. The food or drink reaches a certain point, and is there obstructed. After a time it may regurgitate into the mouth, or, the spasm relaxing, pass into the stomach. The duration of the attack may vary from a single paroxysm to many weeks or months, &c.

During the paroxysm antispasmodics should be given, and in the intervals, measures adopted to remove the cause.

BRONCHOCELE.—*Goitre. Enlargement of the thyroid body, due to endemic causes.*—The inhabitants of certain districts, generally in the neighbourhood of mountains, are liable to suffer from hypertrophy of the thyroid body, which may be limited to the isthmus or one lobe, or involve the whole organ. The swelling, after attaining a certain size, may become stationary, causing no inconvenience, except such as may arise from deformity, but sometimes it increases very rapidly, and assumes enormous proportions. In many instances, after remaining for a long time stationary, it suddenly, without any apparent cause, begins to increase. It is not attended with constitutional disturbance or pain, excepting such as may be caused by its pressure on neighbouring parts. This pressure, which is not always proportioned to the size of the swelling, besides causing pain, may interfere with respiration and deglutition. Goitre has an endemic origin, and is probably due to some ingredient that is mixed with the water drank by the inhabitants of certain localities, but the nature of which is unknown. It is more common in females than in males, and is said to be influenced by the state of the menstrual function, the swelling becoming larger during menstruation and increasing rapidly in size during pregnancy.

When goitre affects persons who live in the gorges or valleys of mountains, it is often associated with bodily deformity and imbecility of mind, and not unfrequently with dumbness and blindness. Persons thus affected are called "cretins." They are often met with in the North-Western parts of India.

In the treatment of goitre, iodine is most to be relied upon. It should be given internally, and applied as an ointment externally. Dr. Mouat of Bengal speaks favourably of an ointment of the biniodide of mercury,* applied whilst the part is exposed to the rays of the sun. The patient should of course be removed from the locality in which the disease originated. The condition of "cretins" may be much improved by pure air and exercise, the use of ferruginous and other tonics, and cod liver oil. When goitre cannot be reduced by medical treatment, surgery has sometimes been more successful: the passage of a seton or a piece of wire through the swelling has led to a decrease in its size; the thyroid arteries have been tied with a similar result. In a case where the swelling was of large size and pressing on the air passage, I saw the late Mr. Liston divide the sterno-mastoid muscle, so as to permit the swelling to expand externally.

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* Indian Annals, No. VIII., page 436.

Enlargement of the thyroid body appears to be sometimes connected with certain anæmic states; a remarkable feature of such cases is, unusual prominence of the eye balls, which seems to be a form of hydrophthalmia. The swelling of the thyroid body is in a marked degree pulsating; there is in general palpitation of the heart; and a *bruit* is sometimes heard in the precordial region. The treatment, it need hardly be said, must be directed to the removal of the anæmia.

Cystic disease of the thyroid body is sometimes met with; the simple hypertrophy just noticed may merge into it. The cysts vary in number and size, and occasionally become very large. They should be punctured and the cavity filled with lint.

CHAPTER III.

DISEASES OF THE HEART AND BLOOD VESSELS.

Situation of the heart.—The heart reaches from the 3rd to the 6th rib; and its base corresponds behind to the 6th or 7th dorsal vertebra. Transversely its limits may be defined by lines—one drawn a little internal to the left nipple, the other about a finger's breadth to the right of the sternum. The heart is overlapped by the lungs, except that portion of it—of a somewhat triangular shape—the apex of which corresponds to the middle line on the level of the 4th costal cartilage, and the base to the lower edge of the heart. The transverse diameter of this space does not exceed two inches. Its exact boundaries are, according to Dr. Walshe, "on the right a vertical line, extending at mid-sternum from the level of the 4th rib to that of the 6th; on the left an oblique line passing outwards, and downwards at a more or less acute angle from the latter opposite the 4th cartilage, and curving inwards again (somewhat within the site of the nipple) to the 6th rib, beside the heart's apex; inferiorly, a line gently sloping to the left, from the central point of the lower edge of the sternum, along the 6th cartilage." For practical purposes, its limits may be sufficiently defined, by taking the cartilage of the 5th rib, mid-way between its connection with the sternum and the bony part of the rib, as a centre, and drawing a circle one inch in diameter. Over this portion of the precordial region, the note is dull on the gentlest percussion; in the remaining portion, where the lungs overlap the heart, dulness is only elicited on firm percussion. The left ventricle, the greater part of the left auricle, and a considerable portion of the right ventricle, are to the left of the sternum. The remaining portions lie behind the sternum, and for about a finger's breadth to the right of it. The most central part of the heart is opposite the sternal connection of the 4th costal cartilage. The semilunar valves of the pulmonary artery are opposite the junction of the cartilage of the left 3rd rib with the sternum; the aortic are a little below and internal, and the tricuspid and mitral at the middle of the sternum opposite the 3rd interspace. So close are the valves together, that an area of half an inch includes a portion of all of them.

When the precordial region is examined, the patient should be placed in the recumbent posture. Mediate is always to be preferred to immediate auscultation. During the contraction of the heart, two sounds (1st and 2nd) are heard; the one coincident with the systole, the other with the diastole of the ventricles. Between the two sounds, there is a slight pause, and a much longer one after the second, and before the recurrence of the first sound. These sounds differ—the first is dull and prolonged, the second clear and short, being only half as long as the first. At the right apex, the first sound is somewhat sharper and shorter than at the left apex, whilst at the right base, the second sound is in similiar degree lengthened and more dull. The sounds may be heard not only in the precordial region, but even much beyond its limits.

PERICARDITIS.—*Inflammation of the Pericardium.*

Anatomical characters.—The anatomical characters of pericarditis in no way differ from those of inflammation of other serous membranes. Thus, at first there is merely turgescence, with suspension of the ordinary secretion, and hence preternatural dryness of the surfaces. Afterwards lymph is effused, which varies according as its fibrinous or corpuscular constituent predominates. Fibrinous or plastic lymph is arranged in layers, which being readily organized, cause the surfaces of the membrane to adhere. When the lymph is more corpuscular than fibrinous, there is a tendency rather towards degeneration than organization, and consequently a greater probability of the formation of pus. If, however, as often happens, the lymph should be caco-plastic, there is neither complete organization nor complete degeneration, the layers of the membrane are agglutinated, but easily separated, and the surface of the imperfectly formed tissue has a villous appearance, being marked by numerous little projections underneath the effused lymph. The membrane in the acute form of pericarditis is of a bright or rose red colour; it is thickened from deposit into the sub-serous tissue, becomes opaque, and is readily torn from its attachments.

The sac of the pericardium contains fluid, varying in quantity from a few ounces to several pints, and in quality from clear transparent serum to turbid puriform fluid or pus itself.

In advanced stages, the parietal and visceral layers may be firmly adherent, either by organized bands of varying length, or what is perhaps more common, uniformly throughout their whole extent. At other times, though lymph is effused in large quantity, no adhesions are formed: it is deposited in successive layers of considerable thickness, which are organized into a sort of fibro-cartilage, and into which calcareous matter is sometimes deposited. It is not uncommon to find white opaque patches *(milk spots)* upon the visceral layer; sometimes they are readily scraped off with the edge of the knife, and are then probably of inflammatory origin; more frequently they cannot be scraped off, the deposit being apparently beneath the membrane. How far inflammation is concerned in the production of these latter spots is at least doubtful.

The other results of inflammation, as ulceration, mortification, &c. are rarely or never met with.

ACUTE PERICARDITIS.

Symptoms.—The symptoms of acute pericarditis are often insidious and obscure. In a typical case they are fever, with more or less, sometimes very severe, pain in the precordial region; weight and stiffness in the left shoulder, and a sense of constriction of the chest; an anxious and pinched face, embarrassed breathing, a frequent, jerking, or irregular pulse, restlessness, and occasionally delirium. In pericarditis as usually met with, viz. in connection with acute rheumatism, one of the earliest symptoms is a change in the expression of the face, which becomes pallid, anxious, and pinched; at the same time, or soon after, the pulse is accelerated, frequently jerking, and sometimes, though rarely, intermitting. The *decubitus* is very peculiar: the patient is unable to lie on either side, but generally reclines in a posture midway between dorsal and lateral, the upper part of the trunk being inclined forwards; or he sits up resting his elbows on his knees. In either case, the posture is selected for the purpose of lessening as much as possible the movements of the left side of the diaphragm. Pain is an uncertain symptom, and when present, is so in varying degrees of severity; it is often increased by pressure upwards of the fingers placed beneath the margins of the ribs. Sometimes there is a feeling of weight and stiffness in the left shoulder extending down the arm. The breathing is hurried, and the pulse, at first full and hard, soon becomes soft and jerking, and occasionally intermitting. Restlessness is nearly always present, and at times delirium, which may be violent. Fever is rarely absent, and when the attack is secondary upon a disease which is accompanied by fever, the febrile symptoms are usually aggravated at the onset of the pericarditis. In the beginning, and occasionally throughout the attack, there may be faintness, though this is by no means so common as was at one time supposed.

Should the inflammation not be subdued, effusion takes place, and fluid accumulates in the sac; the breathing becomes much oppressed, and the action of the heart feeble.

Physical signs.—However well marked the symptoms are in some cases, they are often so obscure, that a diagnosis would be impossible without physical signs.

In respect to physical signs, pericarditis may be divided into three stages:—

1st stage.—In the first or dry stage, the impulse is increased, and a grazing friction sound is occasionally audible.

2nd stage.—In the second or exudative stage, friction sounds are well marked. They may have various characters, which have been likened to rubbing, creaking, squeaking, churning, &c. but there is little or no practical importance in recognising such distinctions. The varieties of sound may be easily explained by the great difference which exists in the kind and quantity of lymph effused. Sometimes the friction murmur accompanies one only, at other times both sounds of the heart, and it is then called a "to and fro" sound. It is often double towards the base of the heart, whilst towards the apex it is heard at the end of the first sound, which it seems to prolong. It is seldom or never heard beyond the limits of the precordial region, and often only in a part of it. It is liable to frequent change of character and place.

3rd stage.—In this stage, the precordial region is sometimes convex and bulging, and its limits increased; the impulse of the heart is weakened, and the friction sound has disappeared, or is only heard at the base. The sounds of the heart seem distant. The dulness on percussion is sometimes considerable in this stage, and the lung being displaced, no respiratory sounds are heard. The shape of the dull spot corresponds with that of the pericardium. Thus the apex or narrowest portion is at the top of the sternum, whilst the base is below.

4th stage.—The dulness disappears and friction sounds are again heard.

It should be noticed, that as effusion takes place, the friction sounds disappear from below upwards; they often linger for a long time at the base of the heart, and, indeed, may often be heard there when the pericardium is nearly filled with fluid.

Progress.—Pericarditis has been known to terminate fatally by syncope in less than forty-eight hours, but this is rare. The usual termination is in recovery, and in general the symptoms begin to yield after seven or eight days. But although the acute symptoms subside, signs of effusion into the pericardial sac may continue for many weeks.

In mild cases, the symptoms, both general and local, are but little marked, and the progress is almost invariably towards recovery. In other instances, effusion of fluid into the pericardial sac takes place early, and the signs of such effusion are the prominent symptoms; whilst in a third series of cases, the muscular tissue appears to be involved, as evidenced by great irregularity of the heart's action. These latter cases are attended with much danger.

Pathology.—Pericarditis is, for the most part, associated with some other affection, and unless caused by injury, is very rarely a separate disease. It is not uncommon in connection with pleuritis and pneumonia, but is so frequently met with in the progress of rheumatism and Bright's disease, as to become a part of their pathology, especially of the former.

When rheumatic, its frequency is often in proportion to the severity of the rheumatic affection. It is most common in young persons—indeed, few persons, and especially females under 20 years of age, affected with acute rheumatism, escape.

The non-rheumatic form is chiefly associated with Bright's disease. Unlike the rheumatic variety, it occurs in elderly persons. The symptoms are never well marked; the morbid appearances are comparatively slight, and altogether it plays but a subordinate part in the pathology of the renal disease.

The first effect of the inflammation seems to be that of an irritant or excitant of the heart's action, hence the increased impulse and palpitation, which are observed in the commencement of the attack. After a time the contractility of the muscular fibre is weakened or suspended, as shown by enfeebled or irregular contraction. Whether the latter is merely the collapse after excessive action, or paralysis from contiguity to an inflamed membrane, does not seem to be quite certain. In this enfeebled condition of the muscular fibre, dilatation of the cavities is apt to occur, with the numerous and serious derangements to which it leads.

The inflammation may without doubt end in resolution, leaving no trace whatever of its existence. More frequently opaque spots, called "milk spots" are left, and in many instances the two surfaces of the membrane become permanently adherent, the closeness and uniformity of the adhesions being dependent upon whether the lymph was effused as a continuous layer or in distinct patches. Great importance was at one time attached to these adhesions: it was thought that they so hampered and obstructed the action of the heart, as to lead to organic changes in the organ. More extended experience, however, has called in question the soundness of these views, and it is quite certain that, if pericardial adhesions are ever hurtful in a great degree, they are so in only a small number of instances.

Diagnosis.—The only disease with which there seems much danger of confounding pericarditis is pleuritis. The more circumscribed dulness; its not varying by change of posture; and the fact of its being well marked in front and not perceived behind; the connection of the friction sounds with the movements of the heart, and the general symptoms, should be sufficient for diagnosis.

Prognosis.—The prognosis is on the whole favourable. Mild cases nearly always do well, even without much special treatment; and notwithstanding that there is evidence of considerable effusion, recovery is rather the rule than the exception. The worst cases are those where the muscular tissue of the heart is in some way involved. The signs of danger are great oppression and anxiety, a very frequent, small, and irregular pulse, cold extremities, and a pale haggard face.

Causes.—The ordinary causes of inflammation are no doubt *capable* of producing pericarditis, but cases traceable to these causes are certainly very uncommon. Mechanical injury is a more efficient cause. Pericarditis has been related to mental excitement, violent muscular effort, suppression of morbid discharges, and the like. But, as before mentioned, it is comparatively a rare disease, unless when it is a complication of rheumatism or Bright's disease.

Chronic pericarditis.—*Chronic* is applied to pericarditis, either when there is a thick layer of lymph which is slow in undergoing change, or a large collection of fluid. These may be the results of acute inflammation, and then, in my opinion, the term chronic is erroneously used—or they may, it is said, arise from a low form of inflammation, which has been chronic from the commencement. The symptoms depend upon the extent to which the action of the heart is impeded by the character of the lymph-effusion and the quantity of the fluid; the former, sometimes deposited in thick layers, and becoming imperfectly organized, contracts, and as it were "strangulates the heart"—the latter, from its mere quantity, obstructs it. Hence, oppression, weight, shortness of breath, weakness and irregularity of the pulse. When the fluid is puriform, hectic fever is not an uncommon symptom. The physical signs are those already mentioned as characteristic of effusion.

Treatment.—In idiopathic cases, the treatment of pericarditis does not differ from that of inflammation of other serous membranes, with the reservation that, as an enfeebled condition of the heart, is one of its consequences, depletion must not be carried so far. It should also be borne in mind, that considerable loss of blood produces irritability of the heart, in which state its action is frequent and even violent; and further, that it favours that tendency to coagulation of blood in the cavities of the heart, which is to be feared whenever its serous membranes are inflamed.

In sthenic persons, blood-letting, general and local, may be adopted in the very early stage, and the system quickly brought under the influence of mercury; afterwards blisters should be applied and repeated, and diuretics, alteratives, &c. given to bring about absorption of the fluid. Unless the patient is decidedly sthenic, local abstraction of blood is always preferable to general bleeding. The treatment of rheumatic or other secondary cases must be adapted to the primary disease. In rheumatic cases, leeches may be cautiously applied, and afterwards small blisters. In very strong persons mercury may be given, but otherwise it is better withheld; eliminants, colchicum, acetate and nitrate of potass should be substituted. In asthenic persons opium is chiefly to be relied upon. It may be given in the form of Dover's powder, and repeated at intervals of four or six hours. When aperients are used, it is advisable to combine with them from ten to fifteen minims of the wine of colchicum.

ENDOCARDITIS.—*Inflammation of the membrane lining the cavities of the heart.*—There is much that is common to both endocarditis and pericarditis: they are each, in many instances, secondary upon the same disease, viz. acute rheumatism; they are made manifest by very similar symptoms, and require very similar treatment. There is, however, this important difference, viz. that in endocarditis, the products of the inflammation interfere with or destroy the function of the valves, and thus derange the mechanism of the heart: the circulation of the blood is in consequence imperfectly carried on, and this in its turn leads to various secondary affections.

Anatomical characters.—The endocardium is reddened, rendered opaque, thickened, and sometimes softened; lymph and other deposits upon the surface of the membrane are much less frequently seen than in pericarditis, doubtless because they are washed away as they are effused by the current of the blood. It is in the situation of the valves that products of inflammation are chiefly met with: this is explained by the arrangement of the fibrous tissue which enters into their formation. "There is found to exist enclosed between the reduplications of the endocardium, a quantity of fibrous tissue. An increase in its amount takes place at the centre of each aortic valve, forming the *corpora Arantii*, and at each of the extremities or angles of the segments. The minute exudations which are formed as the result of the inflammatory process in the endocardium, may be seen to arrange themselves in double festoons, as if suspended from the *corpora Arantii*, often in a row like a string of beads along the line of union of the thick portion of the valve, with the inner convex margin of its two thinner crescentic portions. The repeated attrition of the opposed surfaces of the valves pushes the exudation as fast as it is deposited, and while yet plastic, from the thin crescentic portions of each valve, and so heaps it up along these boundary lines of contact, just as a thin layer of butter on a board would be displaced and heaped up in a little curvilinear ridge by the pressure of one's thumb." These fringe-like projections are called "warty growths or excrescences, or vegetations." By additional deposits and subsequent changes, the orifice of the aorta is much narrowed, thus impeding the passage of blood from the heart. To overcome this obstacle, the walls of the left ventricle become hypertrophied, and as the obstruction increases, the cavity is dilated. But this, perhaps, is the least of the evils to which endocarditis leads: the deposits upon and between the valves and the adjacent layers become organized; adhesions are thus formed of one part of a valve to another, or to the endocardium lining the ventricle or aorta— one segment of the aortic valves has been seen to be bound down to the aorta, and another to the ventricle. At other times, the deposits, not being sufficiently plastic, are imperfectly organized, and consequently do not form adhesions, but increasing in quantity, and becoming indurated, stiffen and impair the efficiency of the valves. Still later, these deposits may be transformed into fibro-cartilaginous tissue, or undergo a calcareous degeneration, by which the valve is destroyed.

Deposits are not limited to the free margins of the valves. They have been found adhering to their surface, and even to the adjacent membrane, and not unfrequently, they are deposited in the meshes of the calumnæ carneæ. It does not seem to be quite certain, whether the lymph deposits in endocarditis are derived from the vessels distributed upon the attached surface of the membrane, or more directly from the blood in the cavities of the heart. It is probable however, that a portion at least of the deposit has the latter source. Lastly, in fatal cases, fibrinous coagula (decolorised) are sometimes found adhering to the lining membrane or to the valves, by which the circulation of the blood must necessarily have been much embarrassed.

Symptoms.—The symptoms and signs of endocarditis are—1*st*, those which are present before the efficiency of the valves is impaired; 2*nd*, those which follow and are due to such impairment.

The earlier symptoms are, uneasiness and oppression in the precordial region ; the face is anxious and expressive of distress, and there is usually well-marked fever, with, in some cases, at first a full as well as frequent pulse. The action of the heart is increased—the pulsation being more than usually visible—and on applying the hand, a well-marked heaving impulse may be perceived. On listening to the precordial region, the first sound will generally appear roughened and prolonged.

After lymph has been deposited, and the function of the valves is interfered with, other symptoms set in, which vary according to the situation of the deposit. When the aortic valves are affected, the blood is not only impeded in its passage into the vessels, but very generally a portion of it regurgitates into the ventricle. The heart is excited to increased action, in order to overcome the obstacle, and, as but a small quantity of blood escapes at each contraction, the frequency of the contractions becomes in a marked degree increased. Thus, there may be a frequent, strong, and heaving impulse, with a small and feeble pulse. When regurgitation predominates over obstruction, the pulse is often very peculiar: at first the vessel is well filled, but it almost immediately collapses from some of the blood which had entered the arteries passing back into the heart. It now and then happens, that bands of lymph are stretched across the orifice of the aorta, and then the pulse has a thrilling character.

When the mitral valve is affected, the respiration soon becomes embarrassed, and symptoms of pulmonary congestion, *i. e.* cough, serous or bloody expectoration, set in. On account of regurgitation from the ventricle into the auricle, the pulse is very feeble.

Other symptoms occur, which result from altered circulation of the blood. The arteries containing less than the proper quantity of blood, faintness, pallor of the surface, cold sweats, and restlessness are occasioned. The blood in the veins being obstructed, congestion in various organs occurs, as in the brain, liver, stomach, &c. and when the whole venous system is congested, more or less general dropsy is produced.

Physical signs.—The limits of the cardiac dulness are extended. The first sound of the heart is prolonged and roughened, and as the deposits are added to, a systolic blowing murmur becomes audible. When the function of the valves has been impaired, regurgitant murmurs are present: diastolic in the case of the semilunar, and systolic in that of the mitral valves. A diastolic murmur is probably always regurgitant—a systolic murmur is either obstructive or regurgitant, and they may be distinguished by observing that the regurgitant systolic murmur is most distinct towards the apex; the obstructive towards the base of the heart, and in the course of the large vessels.

Pathology.—The pathology of endocarditis has reference chiefly to the effect of the inflammation on the valves of the heart. The deposits becoming more or less organized, render the valve inefficient, and by subsequent changes, probably of a fatty or degenerative nature, its function is altogether destroyed. The danger is due in a great measure to the extent and rapidity of these secondary changes, and of course to the quantity of the deposit. When the degeneration is slow and the deposit little, the person, although incapable of any extraordinary effort, is free from suffering or danger. It must be remembered however, that inflammation of the lining membrane of a cavity containing blood, causes a tendency in the fibrin to coagulate; and should this be still further favoured by feeble or sluggish circulation, pale and tough coagula, adherent to the walls, the chordæ tendinæ, or the valves themselves, may so derange the circulation as to lead to very serious or even fatal results.

Diagnosis.—Besides the difference of symptoms already noticed, the diagnosis from pericarditis rests upon the distinction between an *endocardial* and an *exocardial* murmur. There are three characters by which an exocardial murmur may in general be recognised, viz., it is limited to the precordial, or even to part of the precordial region; it often and suddenly shifts its place, or becomes altered in its characters; it precedes or follows, but does not take the place of, the ordinary sounds.

There are other differential characters, but they are not always to be relied upon. Thus, an exocardial murmur sometimes appears superficial and rubbing, and is exaggerated by pressure with the stethoscope. It is often accompanied by a thrill or *fremitus,* which is perceptible on placing the hand upon the precordial region.

Prognosis.—Endocarditis, though rarely immediately fatal, often lays the foundation for changes in the valves of the heart, which ultimately cause death, and the danger is greatest when the mitral valve is affected. Sometimes, under suitable treatment, the deposit may be removed; but if it has been such as to impair the efficiency of the valve, entire recovery is rare. The patient feels that he can no longer attempt many things that he was before capable of accomplishing with comparative ease, and sooner or later the effects of deranged, or altered, or obstructed circulation appear, as faintness, dyspnœa, or dropsy. Nor is the patient at any time free from the danger of sudden death by syncope.

Causes.—The causes of pericarditis are also the causes of endocarditis. Its connection with rheumatism is said to be even more common than that of pericarditis. It has sometimes been traced to phlebitis or pyæmia.

Prognosis.—The prognosis is favourable as regards recovery from the primary attack, but there is always danger of the valves being damaged. Disease of the aortic valves is less serious than that of the mitral valve; and if in the former case the *bruit* is obstructive and not regurgitant, and there is no evidence of dilatation, it is probable little inconvenience will result. But although endocarditis is rarely immediately fatal, yet it has happened that patients have died in a few days. Death in such cases has been attributed to coagula in the cavities of the heart.

Another danger which should not be overlooked in endocarditis, is the detachment of one or more of the fibrinous excrescences from the valves, which, mixing with and being carried by the blood, obstruct arteries even of considerable size, and thus cause disease of the organ or organs to which such arteries are distributed.

Treatment.—The treatment of endocarditis is similar to that of pericarditis. Bleeding, either general or local, must perhaps be employed, with more caution, on account of the tendency of the blood to coagulate in the heart, which is much favoured by a feeble or sluggish circulation. If valvular disease is left, great precaution must be taken to prevent dilatation. The tone of the muscular system should be in every way maintained; moderate and regular exercise should be taken in the open air; a nutritious but not bulky diet should be used, and fluids drank in small quantities. If necessary, tonic medicines, as iron, zinc, &c. may be administered. The patient should be warned against making any unusual effort, or engaging in any occupation or pursuit which requires sudden and violent exercise of bodily strength, and he should also be cautioned as to the danger of all excessive mental emotions.

Enlargement of the heart.—The heart may be enlarged from—(*a*) hypertrophy, (*b*) dilatation, (*c*) abnormal deposition.

HYPERTROPHY.—Hypertrophy of the heart signifies an increase of muscular tissue. It may be limited to a few fibres, or involve the walls of one or more of the cavities. The walls of the left ventricle are the most frequently affected, but sometimes those of the right and occasionally of both ventricles are involved, and in rare instances hypertrophy has been observed in the auricles. It is never general. It may occur without dilatation, but more commonly the two conditions are associated. The existence of hypertrophy may be ascertained after death by the weight of the heart, and the seat of it by a comparison of the thickness of the hypertrophied with the healthy part. The average weight of the organ being from 8 to 10 ounces, we may consider it to be hypertrophied should it weigh from 10 to 12 ounces; and if the walls of the left ventricle measure 7 to 8 lines, or of the right 3 to 4 lines in thickness, we may be sure that those parts are hypertrophied.

Symptoms.—Hypertrophy is probably always compensatory, that is to say, the nutrition, and consequently the size and power of the heart are increased in order that an obstacle to the passage of the blood may be overcome. If, therefore, the obstruction is near the heart, and the hypertrophy exactly proportioned to it, no symptoms are caused by the hypertrophy as such. That various derangements co-exist with hypertrophy, is mainly due to the association with it of other morbid conditions, as for example, arterial or valvular disease, dilatation of the heart, &c. But when the obstruction is distant from the heart, as in the course of a large vessel, or still more when it is in the capillaries, the force of the heart's contraction may cause an undue strain upon the intermediate vessels, and thus lead to derangements of important organs, as the brain, liver, lungs, &c. The prominent symptoms in such cases are giddiness, noises in the ears, flushed face, full and strong pulse, dyspnœa, cough, and palpitation.

The local symptoms and signs of hypertrophy, are more or less uneasiness in the precordial region, and a heaving impulse; the latter is sometimes so strong, as to move the bed clothes, or even shake the bed on which the patient lies. This, however, is chiefly observed in plethoric persons; in the natives of India, hypertrophy may exist without the impulse being in any great degree increased.

Physical signs.—The precordial dulness is extended transversely, reaching beyond the line of the nipple; the apex beats higher and further out than usual. The first sound is deep and muffled.

Causes.—The cause of hypertrophy is impediment to the circulation of the blood; and this may be valvular or arterial disease, aneurismal or other tumours, or some alteration in the physical properties of the blood, whereby it is rendered less easy of circulation. Thus, blood which is too thin or too viscid, does not flow so readily through the vessels as healthy blood, and consequently the heart must contract with more than usual force to propel it. Hence, after a time, it becomes hypertrophied. Moreover, the presence in the blood of certain noxious matters, which should have been removed by the depurating organs, seems to interfere in some way or other with its circulation. This probably explains the co-existence of hypertrophy and some forms of Bright's disease. Obstructive disease in the lungs will sometimes cause hypertrophy of the right ventricle, and but for the safety-valve action of the tricuspid valve, this would more frequently happen. Another cause of hypertrophy is dilatation, which is probably a certain cause, whenever it occurs without impairment of the nutrition of the muscular tissue. It has been thought, that hypertrophy of some fibres may arise from other fibres having been paralysed, as happens in pericarditis and endocarditis, by reason of their contiguity to an inflamed membrane; but without denying the possibility of this, I am not aware that the belief is more than hypothetical.

Treatment.—The treatment of hypertrophy mainly consists in the removal of the cause: when this cannot be effected, and there are derangements which appear to arise solely from excessive action of the heart, attempts may be cautiously made to lessen it. The patient should be kept moderately quiet and upon a low diet. Small quantities of blood may, in plethoric persons, be abstracted. The bowels should be freely moved by the occasional use of saline purgatives. In some cases, when the action of the heart is very strong, remedies may be given which have a sedative influence upon the muscular tissue, as digitalis, hydrocyanic acid, aconite, &c. It must be remembered however, that it is not in every instance of hypertrophy that lowering treatment is required or proper, but only when excessive action of the heart is present, and even then, should there be signs of considerable dilatation, it must be employed with great caution.

Dilatation.—Dilatation of the cavities of the heart, in a greater or less degree, is common and attended with much danger. All the cavities may be affected, but the ventricles, and especially the left, are more often dilated than the auricles. The dilatation is frequently associated with hypertrophy, and then for the most part the walls are thickened; but when there is no hypertrophy they are thin and attenuated. Dilatation may be caused by impediments to the circulation of the blood, and is consequently met with in valvular or arterial disease, or in affections of the lungs. It also arises from weakness of the muscular fibre, often traceable to impaired nutrition from general anæmia. Fatty degeneration is a common cause, perhaps the most common cause, when valvular or other obstructive disease is absent. In all cases where the muscular fibre is imperfectly nourished, dilatation may be immediately occasioned by sudden or too violent exertion; and on the other hand, even when the predisposition is great, may be prevented by carefully regulated exercise. In states of great predisposition, even what might be considered a moderate amount of exercise may be sufficient to cause it, and so also may long continued mental emotion. The consequences of dilatation are very serious, and especially when it is not compensated by hypertrophy. Thus, the heart, from weakness of the muscular tissue, may be unable to respond to any sudden or unusual call, and the cavities being filled with a large quantity of blood, it is, as it were, overpowered, and ceases to act, death taking place in the way of syncope. Should this not happen, the circulation is deranged and obstructed, and various secondary affections are produced.

Symptoms.—The symptoms of dilatation are faintness and palpitation on slight exertion, a soft and feeble pulse, a tendency to œdema of the feet, paleness, puffiness, and lividity of the face.

The physical signs are increased precordial dulness, and a diffused and indistinct impulse. The sounds of the heart are unusually sharp and distinct.

Treatment.—When a tendency to dilatation of the heart is suspected, the greatest care should be taken to prevent its occurrence. All measures calculated to promote and maintain the nutrition of the muscular tissue should be systematically adopted. The patient should take moderate but regular exercise in a cool and bracing climate, and should be much in the open air. His diet should be nutritious, but not bulky; and he should be sparing in the use of fluids. Mild tonics, iron, zinc, &c. may be given. When the quantity of blood seems to be out of proportion to the power of the heart, which in consequence of this is hampered in its action, as evidenced by oppression of the precordia, faintness, &c., relief is obtained by diuretics or mild purgatives. The patient should be warned against excitement of all kinds, bodily or mental. He should carefully avoid any violent muscular effort, as running, walking fast or up hill, &c., and the mind should be kept under rigid control.

Although it has been considered advisable to treat of hypertrophy and dilatation separately, yet in practice they are usually associated. The symptoms in such cases will, of course, be a combination of those which are special to the two conditions, but will vary according as one or other of those conditions predominates. In ordinary cases there will be dyspnœa and palpitation; flushing and lividity of the face; feelings of faintness; and incapacity for exertion. The pulse will be full but soft; the impulse of the heart diffused and heaving, and out of proportion to the strength of the pulse. These symptoms usually come on gradually; the patient's attention is, perhaps, at first attracted by slight hurry of breathing and palpitation on walking fast, or by uneasiness and oppression at the epigastrium after taking food. Uneasy sensations are felt in the head, as transient giddiness, noises in the ears, &c. At first the symptoms are intermittent, and only, perhaps, felt upon some unusual exertion or excitement; after a time they increase and become habitual. By the lower classes of people they are often little noticed, until some secondary affection makes its appearance. Thus, œdema of the feet and puffiness of the face are sometimes the earliest symptoms noticed by them.

ABNORMAL DEPOSIT.—The abnormal deposit which leads to enlargement of the heart is almost invariably of a fatty nature. It may exist upon the surface of the organ, and by its pressure upon the fibres, cause wasting of them and dilatation of the cavities. In other instances, oily matter is deposited within the sarcolemma; the cavities are dilated and the walls thickened. The tissue of the heart when thus changed is softened and of a pale yellowish colour. The symptoms are those which result from feeble action of the heart, and of which fainting, a feeble, slow, and irregular pulse, giddiness, inability for active exercise, are the most prominent. The impulse of the heart is feeble or absent, and the first sound sometimes scarcely audible. When fatty matter has been substituted for the muscular tissue, the disease is incurable, but life may be prolonged for many years. There is always, however, danger of sudden death during the progress of other diseases, or when any unusual demand is made upon the system.

CHRONIC VALVULAR DISEASE.—Valvular disease is often the result of inflammation, and in young persons probably always is so; but after middle age, it comes on slowly and insidiously, without inflammatory symptoms, and would then seem to be due to those perversions of the nutritive process, to which, as age advances, all tissues become more or less liable. The valves of the left are more frequently affected than those of the right side, and the aortic more often than the mitral. Valvular disease may be considered in two points of view:—1, as impeding the passage of the blood; 2, as permitting of its regurgitation. In either case the severity and danger are proportioned to the extent to which the cavities and muscular tissue are secondarily involved.

Anatomical characters.—The most simple change is mere thickening, and when this is not considerable, and the heart is hypertrophied in proportion to it, but little inconvenience is produced. More frequently the fibrous tissue entering into the formation of the valves is altered: it is indurated and converted into a fibro-cartilaginous or cartilaginous substance, which may even become calcareous. The orifices are in this way narrowed and the function of the valves destroyed. Sometimes there are irregular masses attached to the thickened margins, by which the current of the blood is deranged or distorted. The depositions which lead to these changes, may be upon the surface of the endocardium, or between it and the fibrous tissue. In the latter case they occasionally lead to softening and ulceration; not unfrequently portions of the valves are adherent to one another or bound down to the surface of the heart. Another morbid appearance of not uncommon occurrence is shrivelling or atrophy of a valve. The consequences of valvular disease, whether obstructive or regurgitant, or both, are a diminished supply of blood to those parts in front of the obstruction, and an accumulation of it in the parts behind. Thus, when the aortic valves are diseased, the ventricle becomes filled, and when the obstruction is considerable, the auricle also. In disease of the mitral valve, the distension extends from the auricle to the pulmonary veins and afterwards to the lungs, producing congestion of those organs. When the obstruction is very great, the whole venous system becomes congested, and general dropsy is the result. The symptoms of valvular disease can hardly be disconnected from those of hypertrophy and dilatation, to which it leads; and, indeed, in many instances, until the latter set in, the patient is unaware that he is the subject of disease. Sometimes, however, uneasy sensations in the precordial region, *i.e.* neuralgic pain, not unfrequently reaching along the inner side of the arm, slight dyspnœa on exertion, and occasional palpitation, indicate the commencement or early stage of the disease. In many instances the condition of the pulse is significant: unusual frequency or slowness, hardness, or great compressibility and smallness, denote cardiac derangement. Again, in some cases attention is only directed to the heart by the occurrence of some secondary derangement, as dropsy, hæmoptysis, hæmatemesis, &c.

The symptoms of valvular disease have already been described; it remains to consider the secondary affections to which such disease gives rise.

AORTIC DISEASE.—Disease of the aortic valves, whether obstructive or regurgitant, causes dilatation and hypertrophy of the left ventricle. Provided that the hypertrophy is proportioned to the obstruction and dilatation, no inconvenience under ordinary exertion may be experienced; but if from increase in the obstruction, or from want of care in abstaining from those efforts and pursuits which throw an unusual strain upon the heart, the dilatation increases, then the symptoms of that condition set in. Should the patient not die suddenly from syncope, the blood is impeded in its passage from the auricle;—that cavity becomes distended; the pulmonary veins being over-filled, the capillary circulation in the lungs is obstructed, and the right ventricle becomes distended and afterwards the right auricle; and at length the systemic venous system is obstructed, leading to hepatic congestion, ascites, and in the end, general anasarca.

The physical signs of aortic disease are, in addition to those more or less common to valvular disease generally, a systolic murmur, best heard at the base of the heart and in the course of the great vessels; and should there be regurgitation, a diastolic murmur accompanying or taking the place of the second sound.

MITRAL DISEASE.—Disease of the mitral is more serious than disease of the aortic valves; the circulation through the lungs is interfered with, and dangerous symptoms thereby sooner induced. Amongst the earliest symptoms, are those which indicate pulmonary congestion, viz. cough and dyspnœa, with copious serous expectoration tinged red, hæmoptysis, &c. Afterwards, as the congestion becomes more general and extensive, enlargement of various organs supervenes, followed by ascites and general dropsy. Mitral may be distinguished from aortic disease by the systolic murmur being best heard towards the left apex and in the axilla, and by the feeble pulse.

Prognosis.—Valvular disease, though serious, is by no means always fatal; persons live for many years and even to old age with such disease contracted when they were young. So long as the sounds of the heart are distinctly heard, and dilatation has not taken place, there is little immediate danger. Mitral disease is more serious than aortic.

Treatment of chronic valvular disease.—When inflammatory symptoms have been removed, or in cases where they have never existed, no treatment can be of service in restoring the valves to the healthy state. Our attention must therefore be directed to guarding against, or removing, or palliating secondary effects. At first we should try to prevent dilatation, by maintaining the general nutrition in the most efficient state. When hypertrophy and dilatation have taken place, they must be treated as described (page 378). When there is evidence of pulmonary congestion, expectorants are indicated. The serous effusions in general dropsy may often be removed by diuretics and purgatives

Atrophy of the heart.—The heart is sometimes found to be of small size, in some instances not being larger in the adult than the heart of a young child. There may be no structural, and, indeed, no appearance of any disease. Such cases are sometimes traceable to general impaired nutrition, from insufficient food and other causes of general anæmia. The existence of this form of atrophy may be suspected when the precordial limits are diminished, the pulse very feeble, and the impulse scarcely perceptible or wanting. No special treatment is of service. Another form of atrophy is connected with dilatation; indeed, dilatation without hypertrophy is always in one sense atrophy.

Cyanosis. Morbus cœruleus.—Every now and then persons are seen, who from birth have a blue colour of the skin. They are observed to suffer from paroxysmal attacks of dyspnœa, and to be unfit for even the ordinary duties of life; indeed, in the greater number of instances, death takes place in early life, and often during an attack of dyspnœa or syncope. It has been ascertained, that the condition just noticed, is due to a preternatural communication between the two sides of the heart, whereby the arterial and venous blood is mixed, and to some malformation of the pulmonary artery or heart, which interferes with the due oxygenation of the blood. It need scarcely be said, that of curative treatment there is none. By avoiding all sources of excitement, mental or bodily, life may perhaps be somewhat prolonged.

Fatty disease of the heart.—The heart is sometimes hampered by the accumulation of fat upon its surface, prolongations of which, passing inwards between the muscular fasciculi, cause atrophy of the fibres. The symptoms are a sensation of oppression at the præcordium, difficulty in walking quickly, cold extremities, feeble pulse, giddiness, weak cardiac impulse, extensive dulness on percussion over the heart, whose sounds are weak.

Fatty degeneration.—A more serious morbid condition of the heart, is that which is known as "fatty degeneration." The fat, in place of being upon the surface or between the fasciculi, is deposited as molecules within the sarcolemma, taking the place of the sarcous elements. Fibres thus changed, are seen under the microscope to have lost their well-defined outline, and the appearance caused by the transverse striæ. A heart thus affected in an extreme degree, is of a pale colour and friable, the walls of the ventricles being flabby.

Fatty degeneration may occur at all ages, but is most common in elderly persons. Although sometimes existing alone, it is more frequently associated with other morbid conditions, as hypertrophy or dilatation, atheromatous disease of the arteries, and especially of the coronary arteries, &c. The symptoms of fatty degeneration are occasional palpitation and fluttering at the epigastrium, rapid, irregular, or slow pulse, general debility, feelings of faintness, incapacity for any active muscular effort, and shortness of breath, or even dyspnœa. The sounds of the heart are weak, and should the heart be atrophied or dilated, as often happens, the limits of the precordial region will be diminished or increased.

The consequences of fatty degeneration are often very serious: sudden death by syncope, rupture of the heart, or coma, is not uncommon. As regards treatment, it is doubtful if a cure can be effected; but further degeneration, and the effects of it, may sometimes be prevented by a tonic regimen and tonic medicines, and the avoidance of all the causes of dilatation (page 378).

Functional disease of the heart.—Inordinate and irregular action of the heart, known as palpitation, is of frequent occurrence in association with various diseases and general derangements, as in affections of the stomach and lungs, anæmia, plethora, and altered states of innervation. The attack often comes on in paroxysms, and is attended with a feeling of oppression and distress in the precordial region, hurried respiration, ringing in the ears, and giddiness. The impulse is in a marked degree increased, but it is rather sharp than heaving, and the pulse is jerking. A systolic *bruit* at the base of the heart is often heard. Care must be taken not to mistake this sympathetic palpitation for that which is symptomatic of organic disease. The main points of distinction are the following:—absence of physical signs of valvular disease or enlargement; sharp and not heaving impulse; the paroxysmal nature of the attacks, and the more or less complete intermission; their occurrence whilst the patient is at rest, and their non-aggravation or even relief by exercise, except when there is marked anæmia; their connection with those diseases, &c. which are known to induce them, the much greater distress they occasion than the palpitation of organic disease does, and the presence of venous murmurs in the neck.

The treatment of functional palpitation has chiefly reference to the removal of the cause, and of course that involves the cure of the disease to which it is due. In addition, the patient should be warned against the use of nervous stimulants, as tobacco, strong tea or coffee, &c. He should also avoid undue mental exertion. During the attacks, stimulants and antispasmodics often give relief.

ANGINA PECTORIS.—*Paroxysmal derangement of the heart's action, probably due to fatty degeneration of the muscular fibre.*

Symptoms.—The prominent symptoms of angina pectoris, are sudden and violent pain at the scrobiculus cordis, and the left side of the chest, extending down the arm, constriction of chest, and a scarcely perceptible pulse.

The first attack often comes on without any warning, a sudden and exquisitely acute pain being felt, and a sense of constriction in the chest, as if it had been compressed in a vice. Breathing appears almost impossible; the patient feels as if he would be choked or suffocated; he is unable to move, the face becomes pale and expressive of the greatest alarm; perspiration bursts out upon the forehead, and the pulse becomes extremely feeble or even imperceptible. The attack may come on at any time, but most commonly occurs when the patient is walking, and particularly should he be ascending a hill: he is immediately brought to a stand, by a sensation that any, the slightest exertion, will be fatal. In a few minutes the seizure passes off, and then he is as well as if nothing had happened. Sooner or later however the paroxysm returns, and with greater severity. At first many months may intervene, but after each attack the interval becomes shorter, until at length the attack is daily or even hourly. And as the disease, whatever it may be, advances, no exciting cause seems necessary to produce it: the patient is seized in the night as he lies in his bed, or many times during the day; but in some instances death takes place in one of the earlier paroxysms, or even in the very first attack.

Pathology.—Many opinions have been held regarding the nature of this terrible malady. There is now, I believe, little doubt of its being due to fatty disease of the muscular fibre of the heart.

Treatment.—During the attack, stimulants and antispasmodics should be given, and opium, if the pain is severe and continuous. In the intervals, all derangements should if possible be removed, and the strength supported and invigorated in every possible way by tonic regimen and tonic medicines A cure cannot be expected, but the frequency of the attacks may be diminished.

Fibrinous deposits in the heart.—Decolorised fibrinous masses in the cavities of the heart have at all times been recognised and described as "polypi;" but their pathological import has only of late years been determined. It is now known that, when the blood contains a relative or absolute excess of fibrin, or when its circulation is interfered with, coagula may form in the blood vessels or in the cavities of the heart. In the latter situation they will be found adhering to the calumnæ carneæ chordæ tendineæ or valves, often reaching from the right ventricle, along the pulmonary artery, to its bifurcation. They may either form suddenly or slowly; and are sometimes found completely decolorised and firmly adherent. In a case which came under my observation a short time ago, the heart could be suspended by the coagulum. Portions of the coagulum sometimes break off, and mixing with the blood, are conveyed to a vessel through which, from their size, they are unable to pass. The symptoms which have been observed when concretions were afterwards found in the right side of the heart, were those of impending death by syncope, viz. a cold clammy skin, a feeble and rapid pulse, and great dyspnœa.

When the coagula are in the left side, the symptoms are more those of apnœa, viz:—intense dyspnœa, a livid face, &c. Coma usually precedes the fatal termination. Fibrinous concretions are favoured by exhaustion and debility, and have chiefly been observed in connection with pneumonia, croup, bronchitis, phthisis, erysipelas, &c.

That the coagula have formed after and not before death, may be assumed when they are decolorised and firmly adherent, and especially if, as often happens, they are grooved by the blood having passed over them.

DISEASES OF THE BLOOD VESSELS.

INFLAMMATION OF THE ARTERIES.—The arteries are less often inflamed than almost any organ or texture, and when inflammation *does* occur, it is for the most part limited in extent. General arteritis is unknown.

Acute arteritis.—Symptoms.—When a vessel distant from the heart is affected, there is little local pain or general disturbance; but should the inflammation, as often happens, cause coagulation of the blood, the vessel is obstructed and changed into a hard fibrous cord, and gangrene of the parts supplied by it may occur. When the vessel is near the heart, as the aorta, more or less fever and dyspnœa are present, and derangement of the heart's action, as shown by palpitation, restlessness, &c. A loud systolic *bruit* has been heard in the left dorsal region; but in most instances the symptoms are not sufficiently definite to admit of a diagnosis being made.

The appearances found after death from arteritis, have been thickening and softening of the coats from lymph deposits, or pus between them; roughness of the lining membrane, and occasionally lymph upon its surface. The causes of arteritis are very obscure. Injuries, as the application of a ligature, will produce it, and when occurring in vessels near the heart, it is thought to bear the same kind of relation to rheumatism that endocarditis does. Of other causes nothing is known with certainty. If arteritis should be diagnosed, it must be treated upon ordinary antiphlogistic principles.

CHRONIC ARTERITIS AND NUTRITIVE CHANGES IN THE ARTERIAL COATS.

It is scarcely possible to determine whether chronic arteritis is or is not of common occurrence, as it cannot be separated from the perversions of nutrition to which the arterial tunics are liable.

The most common chronic change in the arteries is softening or brittleness of the coats from deposits, either between the middle and inner coat, or into the inner coat itself. These are at first fibrinous, but afterwards undergo fatty and calcareous degeneration. The deposit which is the most common, is termed atheroma. Deposited as a series of fibrinous plates upon the attached surface, or between the layers of the inner coat, it soon undergoes changes : oil globules make their appearance, and afterwards crystaline particles of cholesterine. The deposit is now soft and diffluent, of a yellowish colour, and not unlike pus. The lining membrane is distended and pushed inwards, forming elevations or projections of various sizes and shapes, within the vessels. At a later period, calcareous matter (*amorphous phosphate of lime*) is deposited in the atheromatous patches, causing what has been erroneously called "ossification;" erroneously so called, because there are neither bone corpuscules nor canaliculi. The inner coat is now in general destroyed ; the calcareous matter projects into the current of the blood, and attracts fibrinous coagula upon its surface from that fluid. In some instances, however, the earthy deposit burrows underneath the lining membrane, and encircles the vessel with a dense and hard ring, thus impeding or actually obstructing the passage of the blood. The arteries most liable to atheromatous and calcareous disease are, as a general rule, the aorta and other large vessels, the liability increasing in proportion to the nearness of the vessel to the heart. The changes just noticed are rare in early life, and their frequency increases with advancing age.

ANEURISM.—*A pulsating tumor containing blood, and the sac of which is formed by one or more of the coats of an artery.*

Aneurism generally occurs in consequence of atheromatous disease. The middle or inner coats mostly give way ; the aneurismal sac being formed by the external or cellular coat. There are two principal kinds of aneurism, viz. *true* and *false*. In *true* aneurism, the coats are simply dilated, all of them entering into the formation of the sac; in *false* aneurism, which is the more common, the inner and middle coats are ruptured. There is also a third kind, which is *true* aneurism at first, but afterwards becomes *false;* that is, the coats are in the beginning simply dilated, but subsequently the inner and middle coats are ruptured. Other varieties of aneurism are sometimes noticed, as *dissecting aneurism, hernial aneurism,* &c. Dissecting aneurism is caused when the blood, after having passed through the middle and inner coats, fails to dilate the external coat into a pouch, and in place of doing so, diffuses itself between it and the middle coat, occasionally re-entering the artery by another opening. The *hernial* aneurism is very rare, and is produced by the middle coat giving way, whilst the inner remains entire, the latter is then pushed by the blood through the opening in the former.

When the inner and middle coats are ruptured, the blood passes through the aperture and dilates the external coat into a pouch or sac, on the side of the artery. The walls of the sac become thickened, and the tumour increases in size, pressing as it does so upon the parts in its vicinity, and thus leading to their displacement, destruction, or absorption. At length it attains so large a size, that it approaches the surface, and becomes visible as a pulsating tumor. Still further increasing, some portion of the sac becomes thin, and ultimately absorbed, the surrounding parts forming the boundary—these in turn give way and the sac is ruptured, the blood being discharged externally, or as is more common, into some internal organ or outlet.

During the increase of the aneurismal tumour, changes often take place in its interior: the blood coagulates in successive layers upon the inner surface of the cyst, whereby, in some rare instances, the cavity has been filled up and obliterated, and a spontaneous cure effected. In most cases the obliteration is partial only.

Causes of aneurism.—Assuming that disease of the arterial coats is always present when aneurism occurs, the immediate exciting cause may be the ordinary force of the circulation; but very generally aneurism is traceable to something which has excited the heart's action, or to external violence, &c. Men are much more liable to it than women.

The natives of India are certainly much less often affected with aneurism, and especially external aneurism, than European residents.

THORACIC ANEURISM.—Aneurism within the chest usually occurs in the ascending portion and arch of the aorta. So long as the tumour is of small size, its existence cannot always be ascertained, and even, when it is of a size to press upon surrounding parts, the symptoms are often ambiguous. Should it be limited to the commencement of the ascending aorta, there may, indeed, be no symptoms up to the moment of the patient's death, which is caused by the bursting of the aneurism into the pericardium; but when the transverse or descending portions of the arch are affected, derangements are produced by the pressure of the swelling upon the structures in its neighbourhood.

Symptoms.—The symptoms of thoracic aneurism have reference to the presence of a pulsating tumour in the chest, to derangement of the heart's action, and pressure upon important parts or organs.

A pulsating swelling which occupies much space in the chest, must give rise more or less to feelings of tightness, fulness, and oppression, and to a sensation of throbbing or beating. It impedes the circulation of the blood through the main artery, and thus causes derangement of the function and disease of the heart, as shown by faintness, palpitation, and the signs of hypertrophy and dilatation. But the chief symptoms are produced by the tumour, as it enlarges, pressing upon the parts in its vicinity. The large veins—the venæ cavæ—may be obstructed or even obliterated, causing congestion of the face or of various parts and organs, and ultimately dropsy. When the aneurism presses upon the trachea, bronchi, or recurrent laryngeal nerve, paroxysmal dyspnœa and loss of voice are produced—symptoms not unlike those of laryngitis, for which they have been mistaken and tracheotomy performed. The respiration is wheezing and stridulous, and cough with bloody expectoration is sometimes present. In one side of the chest the respiratory murmur may be feeble as compared with the opposite side, and when this is clearly not due to pulmonary disease or a foreign body in the bronchus, it affords presumptive evidence of the existence of aneurism or other tumour. Dysphagia and great emaciation are often present from the aneurism pressing upon the œsophagus and thoracic duct; and anomalous and severe pains in the chest, shoulders, and arms, from the nerves being compressed; and from the same cause, there may be loss of sensation. When the tumour extends backwards upon the spinal column, the bodies of the vertebræ are absorbed, the cord is pressed upon, and the parts supplied with nerves from that portion of it are paralysed. A less degree of pressure in the same direction reaches the sympathetic nerve, and causes permanent contraction of the pupil of the eye on the affected side. When the swelling springs from the arch of the aorta, the current of blood through the vessels, which take origin at the part of the arch which is affected, is weakened—the pulse in the radial artery of the two sides differs, being in one less distinct than in the other, or altogether wanting.

Most of the symptoms which have been enumerated may be caused by *any* tumour, and consequently they are ambiguous as indicating the existence of aneurism. The most characteristic sign of the latter disease is pulsation in some part of the chest, where it is not ordinarily felt, and should there be swelling, and a bellows-murmur audible with the stethoscope, the existence of aneurism is certain. But these characters are not evident until the tumour has attained a considerable size; but even should there be no swelling, circumscribed dulness, pulsation, and a *bruit* would leave little doubt of the existence of aneurism. Although a bellows-murmur is very frequently heard, yet too much weight must not be attached to its absence, as indicating that aneurism does not exist.

Progress.—The tumour once formed may burst into some organ or outlet, before it has attained such a size as to approach the external surface. Thus, it may open into the trachea or œsophagus, and the patient die from hæmoptysis or hæmatemesis. Death may be almost instantaneous from a sudden gush of blood, but this is not always the case; in many instances there are repeated small bleedings, with intervals of weeks, months, or even a year or more between them. In such cases a small aperture is formed in the aneurism, and this remains plugged by a coagulum which from time to time gives way and allows blood to escape. Should the aneurism not open into the trachea or œsophagus, it may burst into the pericardium or pleura, or through the diaphragm into the stomach or large intestine.

In a certain proportion of cases, the swelling gradually approaches the surface, appearing at the upper part of the chest in front, or between the scapula and vertebral column behind. When arising from the transverse part of the arch, it may even appear above the sternum and sternal end of the clavicles. It is distinctly pulsating, as may be both seen and felt; and the pulsation is synchronous with the systole of the heart. On applying the stethoscope, a loud *bruit* may be heard not unlike the first sound of the heart. The tumour gradually enlarges, and becomes more prominent, sometimes attaining a great size. At length the skin over the most prominent part of it softens and gradually gives way, when there may be a great effusion of blood from which the patient at once dies; but more frequently there is at first a mere oozing and afterwards successive gushes; and several days may elapse before so much blood is lost as to cause death.

In some instances the patient does not die from the bursting of the aneurism, but rather from the injury to surrounding organs caused by its pressure.

ABDOMINAL ANEURISM.—Aneurism is less frequently met with in the abdominal than in the thoracic aorta, and from the yielding nature of the abdominal walls, it occasions less disturbance of surrounding organs.

Symptoms.—After anomalous symptoms of derangement of the stomach, kidney, liver, or spinal cord, &c., a pulsating tumour is detected, in which a bellows-murmur may be heard with the stethoscope. Should the aneurism be in one of the branches of the aorta, the swelling may be raised and isolated; the pulsation, however, still continuing. As the aneurism increases in size, it often causes absorption of the vertebræ, and severe neuralgic pains, extending to the lower extremities. From the fact that tumours of other kinds often exist in the abdomen and sometimes over an artery, the pulsation of which is conveyed to them, it becomes difficult to distinguish them from aneurism. The following points of difference may be noticed. The pulsation in non-aneurismal tumours is felt chiefly on the surface and scarcely at all at the sides—in aneurisms it is perhaps most distinct in the latter situations. Most tumours are hard from the beginning; aneurisms are at first soft, and can be partially emptied, and they only become hard after the disease has existed for some time. The pulsation of aneurisms is distinct so soon as they appear, but tumours over an artery do not begin to pulsate until they have attained a considerable size. The general health in abdominal aneurisms is often but little affected, and death from rupture of the sac is often very sudden. They usually burst into the cavity of the abdomen.

Treatment of thoracic and abdominal aneurisms.—The treatment of internal aneurisms, in which operative interference is inadmissible, has one chief object in view, viz. to favour coagulation of the blood in the sac, whereby it may be filled and obliterated. Formerly it was the practice to endeavour to fulfil this object by repeated abstractions of blood, and by keeping the patient on a very low diet. Experience has shown that this practice is injurious, and reasoning is equally opposed to it. Impoverished blood does not readily coagulate; whilst that condition of the system which results from over depletion leads to frequent and excessive action of the heart, and this cannot but interfere with the process of coagulation. All perhaps that can be done to promote coagulation, is to protect the patient from all mental and bodily excitement,—to diminish excessive action of the heart when present by sedatives, as antimony, digitalis, &c., and to maintain a moderate degree of vigour by a nutritious diet, which is neither bulky nor stimulating. Pain must be relieved by opiates, and other symptoms treated as they occur.

Aortic pulsation.—In persons who are anæmic, dyspeptic, or hypochondriacal, or otherwise out of health, the pulsation of the abdominal aorta is sometimes unnaturally apparent: it may be seen and felt in the epigastrum or at the umbilicus. If the patient is emaciated and the abdomen retracted, the convexity forwards of the spinal column, causes the vessel to project against the anterior abdominal wall, and to present the appearance of a circumscribed pulsating tumour, which closely resembles aneurism. And, as if to make the distinction between this and aneurism more difficult, a bellows-murmur is heard under the stethoscope; but it should be observed, that the latter is perceived for a considerable distance along the course of the vessel, and even in other large arteries; that the pulsation suddenly subsides and returns, and that it is sharper and less heaving than in aneurism, and that it does not extend laterally. The only treatment is the removal of the particular derangement which appears to have induced the abnormal pulsation.

PHLEBITIS.—*Inflammation of the veins.*—Inflammation of the veins is rare as an idiopathic disease. It is often caused by injury, or associated with a diseased state of the blood. In most, perhaps in all cases, it leads to coagulation of the blood, and in this way the products of the inflammation are cut off from the general mass of the circulating fluid. But when, from some cause or other, the coagulum is loose and unstable, it softens down and thus permits of lymph or pus, which has resulted from the inflammation, being mixed with that fluid.

Symptoms and pathology.—The symptoms of phlebitis in a mild form are pain, swelling, and irregular hardness in the course of the inflamed vein, with surrounding tumefaction. Within the vein the blood is coagulated, and becomes agglutinated to the coats of the vessel by lymph. When the inflammation subsides, the coagulum shrivels and shrinks, until the vein is converted into a hard fibrous cord, the vessel being obliterated. Sometimes, in place of this, a hole is gradually drilled through the centre of the coagulum, and the current of the circulation is restored. This form of phlebitis is called *adhesive*. In more severe cases, when probably there is something in the blood which requires to be eliminated, the inflammation extends to the areolar tissue exterior to the vessel, an abscess forms, the coats of the vein soften and give way, and its contents are discharged through the abscess. Whilst these changes are taking place, there is often much febrile disturbance: this is *suppurative phlebitis*.

In the most severe form the symptoms are much more serious. At first they are the ordinary symptoms of fever, with pain and tenderness in the course of the vein, but very soon there is evidence of blood poisoning, viz. great prostration, a feeble and rapid pulse, dry tongue, sordes upon the teeth, low muttering delirium, &c. In extreme cases of this kind, it is possible the blood may not have coagulated at all, but in most instances, coagulation *does* occur, but it is imperfect; the clot rapidly softens, breaks up into a diffluent mass, which, with the exudations of the inflammation, should there be any, mixes with the blood and causes those symptoms and effects which constitute pyæmia. Pyæmia is fully described in works on Surgery, to which the student is referred.

Causes.—Phlebitis is generally caused by injury of a vein; the inflammation often spreads from the part injured to a considerable distance. When thus diffused, it is probable that a predisposition has been given by some abnormal condition of the blood, since veins are often tied after surgical operations, as I have frequently seen, without ill consequences. Phlebitis sometimes arises from extension by contiguity, of inflammation of the surrounding areolar tissue, or from the introduction of a septic poison into the blood. It should however be observed, that pyæmia which is produced by the cause last named, is not necessarily preceded by phlebitis (page 163).

Treatment.—In the treatment of the milder forms of phlebitis, leeches should be applied in the course of the vessel, and repeated if necessary. The part should be kept at rest, and cold lotions used. Sometimes, however, warm fomentations and poultices give most relief. The local applications may be medicated, when there is much pain, with opium, hyosciamus, &c. The bowels should be freely acted upon by saline purgatives, and diaphoretics may be given when there is fever.

In those severe cases, in which there are symptoms of blood poisoning, supporting and stimulating treatment is indicated.*

THROMBOSOR EMBOLISM.—Of late years it has been ascertained, that many local diseases depend upon coagulation of blood in one or more vessels. As already stated, this may arise from arteritis or phlebitis, or the introduction of a septic poison; but when the blood contains an excess of fibrin (*hyperinosis*), coagulation may occur without any obvious exciting cause. It would then appear to be favoured by anæmic or exhausted states, and in an especial degree by that condition of the system which exists in pregnancy and after parturition. The coagulum may be so large as to obstruct wholly or in part the vessel in which it has formed, or if too small for this, it may be conveyed to a vessel of such size as it may be capable of obstructing. Should the vessel be very small, it becomes the nucleus of an abscess; but if of moderate size, nutrition is cut off, and softening or grangrene occurs. In regard to the former occurrence, it is not so much a whole coagulum as a portion broken off from one that usually obstructs the vessel.

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* Erichsen's Surgery, 3rd Edition, page 422.

Although there can be no doubt that coagula may form in the vessels in which they are found, they are frequently brought by the blood from other vessels or even from the heart. And it should be observed, that a minute portion of a coagulum obstructing a vessel, may be so increased in size by successive deposits from the blood which comes into contact with it, as to extend for several inches even into vessels of large size.

SECTION III.

DISEASES OF THE HEAD AND SPINE, &c.

The classes of disease treated of in this section, are affections of the nervous system and of the organs of special sense. The nervous system consists of nervous tissue (*white and gray*) collected into central masses (*brain and spinal cord*); of nerves, by which the central organs are brought into relation with parts at a distance; of numerous small masses (*ganglia*), which are connected with one another and the larger masses just noticed by nervous filaments (*sympathetic system*); and of gray matter at the peripheral extremities of certain nerves.

The *gray* matter, in which nervous force or power originates, is composed of cells, many of which are directly connected with the axis cylinder of the white or conducting fibres.

The *white* matter consists of minute tubes, which convey or conduct impressions to and from the gray matter.

The gray matter at the peripheral extremities of certain nerves plays an important part in defining the kind of impression that is to be conveyed to the nervous centres.

In the encephalon, the gray matter is for the most part superficial, the white matter being within it; in the spinal cord, the white matter is near the surface, and the gray matter the most deeply placed. Decussations or crossings of the fibres of the white matter take place in certain situations, viz. in the anterior pyramids of the medulla oblongata, and in the gray matter of the spinal cord; and hence in diseases of the brain we are able to explain loss of motion and sensation upon the side of the body opposite to the side of the brain which is diseased; and in affections of the spinal cord, loss of sensation on the opposite, and loss of motion on the same side, as that which is diseased.

The functions of different parts of the nervous system are at present but imperfectly ascertained. It is probable that the cerebral hemispheres above the *corpus callosum* are subservient to sensation, volition, the emotions and passions, and the intellectual faculties, and the parts below it, including the spinal cord, to the various movements, which are harmonised by the co-ordinating influence of the cerebellum. The sympathetic system, it is probable, regulates automatic movements and the circulation of the blood in the small vessels.

The following aphorisms from Dr. Bennett's Principles and Practice of Medicine may be usefully remembered:—

1.—The brain proper is that portion of the encephalon situated above the corpus callosum.

2.—The spinal cord is divided into a cranial and a vertebral portion.

3.—The gray matter evolves, and the white conducts nervous power.

4.—*Contractility* is the property peculiar to fibrous texture, whereby it is capable of shortening its fibres. Motion is of three kinds:—*contractile*, dependent on muscle; *diastolic*, dependent on muscle and spinal cord; *voluntary*, dependent on muscle, spinal cord, and brain.

5.—*Sensibility* is the property peculiar to nervous texture, whereby it is capable of receiving impressions. *Sensation* is the consciousness of receiving such impressions.

CHAPTER I.

DISEASES OF THE ENCEPHALON.

Diseases of the encephalon or brain are investigated with more difficulty than diseases of other organs. From the unyielding nature of the cranium, we are unable to ascertain the physical condition of the parts within. Neither the senses of touch nor of sight can be made available; and even the sense of hearing, which stands us so much instead in investigating diseases of the chest, is here altogether valueless; the performance of the functions of the brain not being attended with sound. And even the *symptoms* upon which we most rely are very ambiguous; for example, the patient's description of his feelings is liable to mislead, by reason of the intellectual function partaking of the general nervous derangement; whilst in not a few instances the intellectual function is altogether suspended. Moreover, there are no definite symptoms which are related to special alterations of the nervous substance; but on the contrary, the same or similar symptoms are often present in very different pathological states of the organ; and, on the other hand, what appears to be an identical condition of some part of the brain, has been attended with symptoms which are entirely dissimilar.

It must also be observed, that the structure of the nervous system does not present any obvious or mechanical adaptation to its function. A knowledge of the anatomy of the lungs or of the heart, enables us to predict the derangements of function to which certain alterations of structure must inevitably lead. If a valve of the heart is destroyed, we know that regurgitation of blood will take place; if an air cell is filled with fibrinous effusion, we are equally certain that air cannot enter. But we are unable to predicate of any part of the brain, that an altered condition of the nervous substance will necessarily cause a certain or special derangement.

Our imperfect acquaintance with the anatomy and physiology of the nervous system, is another source of difficulty. The mutual connections and relations of its several parts have not as yet been clearly ascertained, and we are still in many instances ignorant of the part of the nervous system which is subservient to the performance of a particular function. Notwithstanding these difficulties, there is much that we *do* know, and much more that is in course of being known.

INFLAMMATION OF THE ENCEPHALON.—Before entering upon derangements of the circulation within the head, a preliminary question of some importance requires to be determined, viz., whether the quantity of blood in the brain is liable to vary as in other organs. It was at one time assumed, that the dense unyielding case within which it is contained, removes the brain from the pressure of the atmosphere; and from this the inference was drawn, that the amount of fluids must always be the same. Experiments were made, which seemed to confirm the views that were theoretically advanced, and they are still thought by some to be conclusive. I believe, however, that most pathologists of the present day doubt if the vessels of the brain are altogether exempt from the pressure of the atmosphere; the communication which exists between extra and intracranial vessels, through numerous apertures in the cranial bones, remove the latter from the category of tubes in an air tight compartment. Moreover, experiments made by Dr. Burrows, seem to have established the fact, that abstraction of blood from the body generally does lessen the quantity in the brain. Nevertheless it is certain, that variation in the quantity of blood is less than in other organs, and there is good reason for believing that its loss is in part at least supplied by effusion of serum.

Inflammation may be limited to one of the constituent parts of the encephalon, but this is rare; in whatever structure it commences, it nearly always involves other parts in the neighbourhood. Thus, inflammation of the membranes extends to the surface of the brain, and inflammation of the brain to the adjacent membranes. Nevertheless, a predominance of certain symptoms may generally be noticed, according to the degree to which one or other of these structures is involved.

DISEASES OF THE MEMBRANES.

Although it is convenient to consider diseases of the membranes and of the cerebral substance separately, it may be repeated, that disease is seldom restricted to one of them.

INFLAMMATION OF THE DURA MATER.—Inflammation of the dura mater is rare as a primary or idiopathic disease, but not uncommon in injury of the head, caries of the bones of the ear, and syphilis.

Symptoms.—The symptoms are obscure and insidious: the most characteristic are restlessness, or its opposite, drowsiness; pain in some part of the head, slight delirium, and a slow or a frequent, unequal, and intermittent pulse. In some instances many even of these symptoms are wanting: pain or fever may be alone present, and this sometimes exhibits so periodical a character, as to simulate ague.

Inflammation of the dura mater, following injury of the head, is described in works on Surgery, to which the student is referred. When associated with otitis, it may occur at an early or late period of that disease. Within a few days after pain has been felt in the ear, the patient becomes oppressed and drowsy; or restless, delirious, and excited, and afterwards comatose. The rapidity of the course of the attack depends upon whether or not the inflammation extends to the arachnoid and pia mater; should it be limited to the dura mater, it may extend over several weeks, but when all the membranes are involved, death usually occurs in a week or ten days.

It more frequently happens, that the dura mater becomes inflamed when disease has long existed in the ear, and after the bones have become carious. The attack generally comes on upon a sudden cessation of the discharge, and is characterised by pain of the head, languor, drowsiness, and in many instances delirium and coma. But the symptoms are liable to vary.*

In secondary syphilis, fixed pain in the head often occurs, and probably arises from inflammation of the dura mater, similar to that which affects other fibrous textures in that disease.

Morbid appearances.—The membrane is usually separated from the bone, which is rough and discoloured. It is softened, of a dark colour, and easily torn; lymph or pus may be found between its outer surface and the skull.

MENINGITIS.—*Inflammation of the arachnoid and pia mater.*—By meningitis is understood inflammation of the arachnoid and pia mater, and probably also of the superficial surface of the brain. It is seldom or never that inflammation is restricted to one of these membranes.

ACUTE MENINGITIS.—*Symptoms.*—The symptoms of acute meningitis present so much variety, that three stages may be distinguished:—

1*st stage.*—The attack sets in with pain, convulsions, or vomiting, or these symptoms may be all present. The pain, though constant, is liable to exacerbation at short intervals, and at these times, when children are the subjects of the disease, a peculiar scream is heard. Between the attacks the child either lies in a drowsy state grinding the teeth, or moves the head from side to side. The eyes are blood-shot, the head is hot, and the face flushed, but sometimes unusually pale; its expression is that of suffering. There is much intolerance of sound and light, and in children frowning and closure of the eyelids; the pupils are contracted. Vomiting, especially in children, is a very common symptom.* The mind is affected: children are irritable and peevish when roused from their state of drowsiness; adults, on the other hand, are apt to be wakeful and delirious, and sometimes the delirium is violent or even furious. The general disturbance is characterised by febrile heat, a frequent and hard pulse, and hurried respiration. The bowels are usually costive, but sometimes diarrhœa precedes and accompanies the attack.

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* For full information on this interesting subject, the Student is referred to Dr. Watson's Lectures, 4th Edition, Vol. 1, page 379, and to some excellent lectures by Mr. Toynbee in the Lancet.

It will be observed, that the symptoms in this stage are for the most part such as are produced by excitement or exaltation of the cerebral functions. Its duration is from one to three days, when the second stage commences, which is characterised by depression.

2nd stage.—The wakefulness and delirium pass into drowsiness and coma. Although the head continues hot, the surface of the body becomes coldish; the pupils are dilated, and insensible to light, and not unfrequently there is strabismus, with rolling of the eye-balls; or there may be optical illusions or total blindness. The muscular system is much affected, spasm and paralysis of different sets of muscles being often observed. The pulse falls to or below the natural frequency, but is liable to be much accelerated by the slightest exertion; the respiration is irregular and sighing, and the tongue becomes dry and furred.

This stage may be prolonged for fourteen or fifteen days, but usually lasts for a week, when the disease passes into the third stage.

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* Vomiting in young children, continuing for several hours or days, should always excite the suspicion of cerebral disease.

3rd stage.—The coma now becomes profound; all the muscles are relaxed, and the urine and fæces are passed involuntarily; the pupils are dilated and immovable, and there is complete blindness and deafness. The tongue is dry and brown; the teeth and lips are covered with sordes; and the abdomen is tympanitic. Just before death the pulse often increases in frequency, rising to 140 or 150 beats in the minute.

Although the stages just described can often be readily recognised, it not unfrequently happens, that one or more may be so short as to be indistinct. Thus, the attack sometimes appears to commence with the symptoms of the second stage, and at other times the progress is so rapid, that the third stage is reached without the symptoms of the second stage having been noticed.

Duration.—The duration of acute meningitis is uncertain: it may be prolonged for five or six weeks, or may be fatal in three or four days. Death most frequently takes place in from one to three weeks.

Anatomical characters.—The membranes are reddened, and the arachnoid is opaque and thickened. Serum, lymph, and pus are found upon the surface, or between it and the pia mater; or between the latter and the surface of the brain, dipping in between the convolutions.

Chronic meningitis.—Chronic meningitis may follow an acute attack, or set in without it. The symptoms are headache, drowsiness, and deranged muscular movements. In children vomiting is common. When the membrane over the hemispheres is affected, the mind is disturbed and paralysis sooner or later ensues. The delirium varies much in kind: sometimes it is monomania, but subsequently becomes mania or idiotcy. The muscles, as the disease advances, are rigid and liable to irregular twitchings. Epilepsy often precedes the fatal termination.

In fatal cases, besides the usual products of inflammation, the glandulæ Pacchioni are enlarged, and the membrane in which they are situated adherent to the surrounding parts. Calcareous matter, and even plates of bone have been met with.

Cerebritis.—*Inflammation of the substance of the brain.*—The symptoms of cerebritis do not at first differ from those of meningitis, and indeed, the two diseases are very generally associated together; but when inflammation of the nervous tissue predominates, there is more derangement of the muscular system, and loss of nervous power at an early period of the attack. There are often general convulsions, or clonic spasms confined to a set of muscles, and these are soon followed by paralysis and coma. Should the inflammation be confined to the nervous tissue, the symptoms of excitement may be absent, the pulse being slow from the commencement. In such cases there is often deep-seated headache, and the patient is dull and apathetic.

Partial cerebritis.—Partial is more common than general cerebritis. It is made known by deep-seated headache confined to one part of the head, loss of motion, and perverted sensation in a few muscles, or a limited extent of skin. For example, speech may be thick and indistinct, or there may be weakness of an extremity, and numbness, tingling, pricking, or some other abnormal sensation over a greater or less extent of skin either of the body or extremities. The mind is usually disturbed or confused, and the organs of special sense blunted. Convulsions sometimes occur, and not unfrequently a muscle or set of muscles is spasmodically contracted.

The severity of the disease is not always proportioned to the extent of the lesion, but is more related to its situation: inflammation of limited extent in the neighbourhood of the medulla oblongata is rapidly fatal.

General febrile disturbance is but little marked in partial cerebritis, but the scalp is usually hot. Coma sooner or later sets in, and is often accompanied by convulsive fits, in one of which the patient may suddenly die, or he may gradually sink from exhaustion.

Cerebritis is sometimes *chronic*, and is then often connected with the tubercular diathesis. The symptoms are similar to those above noticed, but are very slow in their progress, and not unfrequently intermit for a longer or shorter time. Paralysis of a single muscle or set of muscles often comes on very gradually, beginning in one of the feet or hands; many months may elapse before the whole of the limb is involved.

Pathology.—As before mentioned, inflammation is rarely limited to the cerebral substance, and perhaps never when it is near the surface. In fatal cases, the brain is found, on a section being made, to be studded with an unusual number of red points or dots, of larger size than are ordinarily seen, and which are due to divided capillaries filled with blood. There are also red patches and stains of various sizes, which are probably produced by extravasation of blood from rupture of some of the vessels. These are the appearances of the early stage of the inflammation. At a later period, the nervous tissue becomes soft and pulpy, and at length broken up into a diffluent mass, mixed with blood and pus.

In the neighbourhood of the softening, there are patches of redness from rupture of vessels of considerable size; sometimes blood is extravasated into the softened mass, and then there are dark red spots, varying in size from a pin's head to a pea.

When suppuration has occurred, the pus may be limited to a small extent of the surface of the brain, or infiltrated throughout a large portion of its substance. It is often collected into one or several abscesses, which are encysted when they have existed for any considerable length of time.

Under the microscope, at an early period of the inflammation, exudation corpuscules and granule cells are readily detected, and later, when suppuration has occurred, pus corpuscules are abundant.

Softening of the brain not inflammatory.—Softening of the brain is not always caused by inflammation. It may arise from obstruction in one or more of the vessels of the brain. The obstruction may be a coagulum in the vessels, which has either formed there, or been brought from some other vessel, or a fibrinous concretion from the valves of the heart. When the coats of the small vessels are diseased, the blood does not circulate freely through them, and consequently white softening may result from imperfect nutrition. Lastly, white softening has been observed in anæmic children, apparently due to general impairment of the nutritive function.

Non-inflammatory may be distinguished from *inflammatory* softening, by the absence of exudation and pus corpuscules. The derangements to which it generally leads will be considered under paralysis.

ENCEPHALITIS.—*Phrenitis. Brain fever. General inflammation of the encephalon.*—When inflammation involves at the same time all the contents of the cranium, it is called encephalitis or phrenitis. The symptoms are a combination of those of meningitis and cerebritis. At first there is a period of excitement, indicated by headache, wakefulness, intolerance of light and sound, furious delirium; or what is more common, quickness and impatience of manner, and partial insensibility to surrounding objects. At the end of from twelve hours to three or four days, depression comes on, as described under cerebritis. The morbid appearances are similar to those in meningitis and cerebritis.

Causes of cerebral inflammation.—Cerebral inflammation is rarely produced by the ordinary exciting causes of disease, as cold, heat, &c. but is mostly associated with other diseases. Thus, it is not uncommon in fevers, and especially the exanthemata. Its connection with injury and disease of the ear, and with syphilis has already been noticed. Irritation at the peripheral extremities of certain nerves is not an uncommon cause, as inflammation of the gums during dentition, worms in the intestinal canal, &c. The suppression of natural evacuations, as of the urine, &c. is often followed by cerebral inflammation. Of individual causes may be mentioned intense mental application, exposure to the sun, alcoholic liquors, hæmorrhage into the brain, various poisons in the blood, formation of tumors, &c.

Diagnosis.—Cerebral inflammation may be distinguished from mania by the absence of fever in the latter disease. From cerebral disturbance in certain fevers, by observing that in them delirium does not usually come on until several days after the commencement of the attack; that the muscular symptoms in cerebral inflammations, *i. e.* convulsions, paralysis, &c. are more marked, and that the pulse is liable to greater irregularity. In the advanced stages of fever, adynamic symptoms, dry tongue, sordes about the teeth, &c. will throw much light on the nature of the attack.

The diagnosis between cerebral inflammation and delirium tremens will be considered under the latter disease.

Treatment of cerebral inflammation.—In the early stage, when the pulse is hard, general blood-letting is indicated; but when the attack has occurred in persons who are not sthenic, it will be sufficient to apply leeches to the head; when general bleeding is practised, the blood should be drawn from the patient whilst he is in the erect posture, and in such quantity as to induce fainting. The propriety of repeating the bleeding must be left to the judgment of the practitioner, but should the hardness of the pulse return, there need be little doubt. The bowels are to be freely acted upon by drastic purgatives—as jalap, colocynth, croton oil, &c. and these medicines are often usefully combined with calomel. The purgatives should be frequently repeated, as it has been found that they are more beneficial in cerebral inflammation than in other inflammatory diseases. The head must be shaved and cold constantly applied. The action of the heart may, if necessary, be still further depressed by nauseating doses of tartar emetic, but care must be taken not to produce vomiting. After the above measures have been adopted, the system should be brought under the influence of mercury. For this purpose, calomel may be given internally, in doses of two or three grains every three or four hours, or mercurial ointment may be rubbed into the skin, or both of these methods may be adopted at the same time. If the patient becomes drowsy, and the pupils are dilated, a blister should be applied to the scalp.

In the more advanced stage, when the pulse becomes slow and feeble, stimulants must be given.

TUBERCULAR MENINGITIS.—*Acute hydrocephalus. Inflammation of the membranes and substance of the brain, connected with, if not due, to the deposit of miliary tubercle.*—Tubercular meningitis may occur at all periods of life, but is usually met with in children under five years of age. The symptoms are obscure and uncertain. At first the child is languid and peevish, and unwilling to take part in childish amusements. It is soon observed that there is intolerance of light, and sound, and contraction of the pupils; and headache and giddiness are complained of. There is more or less febrile disturbance of a remittent or even intermittent character; at times there is vomiting, and the appetite is either bad or inordinately voracious; the tongue is furred, and the bowels are generally constipated. The child is drowsy and unwilling to answer questions, but at the same time restless and uneasy. During sleep, grinding of the teeth is often noticed; sometimes it awakes from sleep with a violent scream, and occasionally there is delirium. Should these symptoms not be relieved, the disease, at the end of three or four days, passes into what may be called the second stage. The headache is now more severe; so severe, indeed, as to cause the little patient to scream; vomiting becomes frequent, and nausea is occasioned by the slightest movement. The eyes are closed, and the brows contracted; the pulse is much accelerated, and the heat of skin continues. Towards the end of this stage, the pulse changes its character and becomes slow, but is accelerated on the slightest exertion; the restlessness passes into stupor and partial insensibility; there is squinting and dilatation of the pupil, and not unfrequently there are convulsions and paralysis. At the end of seven or eight days, the second gradually passes into the third stage, in which there is complete coma, a feeble and sometimes very rapid pulse, and a cold clammy skin, with convulsions and paralysis. It must not be supposed that the so-called stages of this disease can always be recognized: in some instances coma and convulsions come on at an early period, by which the attack is suddenly terminated; and in like manner the occurrence may be sudden without any of the premonitory or precursory symptoms that have been above noticed.

The duration of tubercular meningitis is from a week to a month or more. During its progress there are often remissions and deceitful appearances of recovery.

When this disease occurs in the adult, it is always associated with tubercle in the lungs.

Pathology.—The most important part of the pathology of tubercular meningitis, is its association with the scrofulous diathesis, and the deposition into the pia mater and substance of the brain of tubercle, which in the former situation is always miliary.

Morbid appearances.—The convolutions of the hemispheres are flattened from the pressure of fluid in the ventricles. At the base of the brain, greenish, tenacious lymph is found covering the pons varolii and parts in its neighbourhood. The pia mater is charged with minute white particles—miliary tubercles and exudation. The ventricles are distended with fluid, which may be as much as four ounces in quantity. The boundaries or walls of the ventricles, especially the fornix and septum lucidum, are soft and diffluent.

Prognosis.—Tubercular meningitis is always a dangerous disease; a certain proportion of cases however recover when treated in the early stage.

Treatment.—Tubercular meningitis being essentially an inflammatory disease, active depletive measures might appear to be indicated; but the subjects of it are usually children, and in ninety-nine cases out of a hundred, scrofulous children, who do not bear depressing treatment. Leeches may be applied to the head at the commencement of the attack, but not in such numbers as to cause depression. Purgatives should be given, and cold applied to the head, and afterwards blisters used. There is much difference of opinion as to the use of mercury; on general principles it appears to be contra-indicated, but is said to have been in some instances very successful. I do not myself use mercury in tubercular meningitis. Iodide of potassium is a remedy on which I place more reliance.

Determination of blood to the brain.—When blood is determined to the head in moderate degree, the cerebral functions are simply exalted, the mind is active and energetic, the senses are acute, and voluntary muscular movement is vigorous. But when the determination is great, the exaltation or excitement is such as to cause uneasiness and discomfort. The head is throbbing and painful, with giddiness and flushing of the face and a feeling of fulness; there is impatience of sound and light, with uneasy sensations in various parts of the body. The pulse is full and hard, and the carotid arteries are throbbing.

The determination may be so great as to be in itself dangerous, but more frequently it is the precursor of inflammation or of apoplexy.

Amongst the causes of determination, are close mental application or violent excitement of the mind, blows on the head, exposure to the sun, febrile disturbance, &c. It is also produced by peripheral irritation—as by dentition—irritating matters in the stomach or intestinal canal, &c. Hypertrophy of the left ventricle of the heart is often mentioned amongst the causes. Lastly, there is a state of nervous irritation which predisposes to its occurrence; as does likewise a plethoric, gouty, or rheumatic diathesis, to which may be added intemperate habits.

In the treatment, the cause must be sought for and if possible removed. When the attack is slight, restriction of the diet, and the use of a moderately active purgative will be sufficient. In more severe attacks, abstraction of blood, cold to the head, perfect rest, and strict antiphlogistic regimen are necessary. When the stomach is not irritable, antimony may be given. This, and indeed any kind of treatment, can only be of temporary benefit so long as the cause remains in operation.

Congestion of the brain.—Congestion of the brain is caused by obstruction to the return of blood to the heart, or inability of the latter organ to propel the blood. Thus, it arises from a dependent position of the head, a tight necktie or a ligature round the neck, the pressure of tumors, &c. or from plethora or anæmia. When caused by obstruction or plethora, the symptoms are sluggishness, drowsiness, or even coma; the face is swollen and livid, the extremities are cold, and the pulse and respiration slow. When connected with anæmia, the face is pale; and there may be symptoms not unlike those which indicate determination of blood; as, for example, throbbing in the head and headache, noises in the ears, giddiness, muscular twitchings, and even convulsions. The paleness of the face, the jerking and easily compressible pulse, and the aggravation of the symptoms when the patient assumes the erect posture, will be sufficient to indicate the nature of the derangement.

The treatment of congestion has mainly reference to removal of the cause. Obstructions and plethoric and anæmic states must of course be removed. But if this should not be possible, the patient must be placed in circumstances in which there are as few calls as possible upon the brain.

It is probable that the functions of the nervous centres may be exalted or depressed without the vascular system participating in the derangement; but in practice, it is usually found that the capillary circulation is more or less involved. When there has been determination or congestion of blood, the vessels after death are full, and the cut surface of the white matter shows an unusual number of red spots.

APOPLEXY.

By apoplexy is understood sudden loss of consciousness and of voluntary motion, from pressure upon the brain originating within the cranium, the respiration and circulation not being suspended. The attack may be quite sudden, but is often preceded by more or less derangement of the cerebral functions. In a typical case the patient falls to the ground, and lies in a state of complete insensibility, from which he cannot be roused; the pulse is full and slow, and the breathing laboured and accompanied by a snoring noise.

Pathology.—Apoplexy often depends upon the rupture of one or more vessels and effusion of blood, but may be due to congestion, and possibly to the pressure of effused serum. Pressure upon the nervous tissue is usually assigned as the immediate or proximate cause of the symptoms; but it is probable that the derangement of the capillary circulation, which occurs when pressure exists, is also concerned in producing them. Moreover, the functions of the encephalon may be suspended by poisons in the blood, and symptoms, similar to those of apoplexy, be thereby induced without pressure being in any way operative.

The morbid appearances which have been most frequently observed, are effusions of blood into the cavity of the arachnoid and sub-arachnoid space, or upon the surface or into the ventricles and substance of the brain. The quantity of the effusion may vary from a few drops to several ounces. The rapidity with which death takes place depends in part upon the quantity of the effusion and in part upon its situation: when the quantity is very large, death may occur in a few hours, whereas when the quantity is small, the patient seldom dies from a first attack. It must however be remembered, that effusion of blood near the medulla oblongata, or into the ventricles, is often speedily fatal, although the quantity may be small. The appearance of the blood will vary according to the time that may have elapsed after its extravasation. In rapidly fatal cases it may be fluid, but generally it is more or less coagulated, and the coagulum may have undergone various changes (page 35). When the blood has been effused into the substance of the brain, it forms for itself an irregularly-shaped cavity; inflammation is excited in the portion of the nervous tissue which surrounds this space, whereby it becomes softened, and the *débris* mixes with the blood. The hæmorrhage is generally due to rupture of one or more blood vessels from disease of the coats. This is often associated with Bright's disease of the kidney, and thus explains the frequency of sanguineous apoplexy in connection with renal disease. Disease of the coats of the arteries is often present with softening of the nervous tissue, which is owing to the blood not freely circulating through the diseased vessels; but softening may also be the result of inflammation. Not unfrequently, however, it is caused by the nutrition of a part of the brain being cut off, in consequence of direct obstruction in the blood vessels. The obstruction may be a coagulum, or a fibrinous particle from the valves of the heart. Patients sometimes die under symptoms of apoplexy, and yet neither effusion of blood nor change in the cerebral structure can be discovered. Serum may occasionally, indeed, be observed in the ventricles and at the base of the brain. Such a case was at one time viewed as an example of apoplexy, from the pressure of serous fluid, and was called "*serous apoplexy*." It is at least doubtful if the serous effusion is the cause of the apoplectic symptoms. It is possible that congestion may exist during life sufficient to cause apoplexy, and its appearances cease to be visible after death. This may explain apoplexy, occasionally met with, in which nothing abnormal can be detected after death. But it is more likely, that most of the cases recorded as "simple apoplexy," in which nothing could be detected in the brain, were in reality examples of Bright's disease of the kidney, or of fatty degeneration of the heart.

Premonitory symptoms.—An apoplectic attack is generally preceded by premonitory symptoms, of which the following are the most notable:—headache, giddiness, confusion of mind, forgetfulness, transient deafness, noises in the ears, impaired articulation, muscular twitchings or rigidity, partial paralysis, perversion or loss of sensation, formication, anæsthesia, &c. These symptoms are not of course all present in any one case, and they may indeed be all wanting. Still, in most instances, a sufficient number may be observed to draw attention to what is impending. In some instances, in addition to the premonitory symptoms just stated, there is fulness of the veins of the face and neck, and increased pulsation of the carotids. The pulse and respiration are slow and laboured, and the extremities cold.

Apoplexy with sudden coma.—After or without premonitory symptoms, the patient suddenly falls down and becomes insensible. The pupils are generally dilated and immovable; the pulse is full and slow, and sometimes intermitting, but occasionally small and weak, and the breathing stertorous. Sensation and perception are destroyed. Convulsions sometimes occur, or there may be rigidity and contraction of muscles, sometimes on one side only. From this condition there may be no recovery, death occurring within a few minutes or a few hours, or not for several days. But not unfrequently consciousness is slowly restored, and the recovery may be complete; or what is more common, more or less derangement of the mental functions is left, and paralysis of certain muscles. Thus, the patient's memory is impaired, or his intellect weakened, or there may be paralysis of the muscles of the face or of the tongue, or of one or more of the extremities.

Apoplexy with subsequent coma.—An attack of apoplexy sometimes commences with sudden and violent headache and syncope. The patient falls, the skin is cold, and the pulse feeble. These symptoms soon pass away—perhaps in a few seconds—consciousness and the power of walking about are restored. In a period varying from a few hours to several days, the pulse becomes full and the skin above the natural heat; at the same time the patient is drowsy and forgetful, coma follows and speedy death. The interval between the first attack and subsequent coma may vary from a few minutes to several days.

Causes of apoplexy.—Men are more liable to apoplexy than women, and old than young persons; nevertheless, neither women nor children are exempt. The most numerous attacks have been noticed between 50 and 60 years of age, but it is probable that the tendency to this disease increases progressively with age. The reason why fewer attacks are recorded between 60 and 70 than between 50 and 60 years of age is, that fewer persons are living in the former than in the latter period.

There can be no doubt of the effect of hereditary predisposition, or of the sanguine temperament in favouring the occurrence of apoplexy. At the same time it occurs very frequently where no hereditary taint can be discovered, and in persons whose temperament is the reverse of the sanguine. Amongst predisposing causes may be also mentioned sedentary habits, too close mental application, free living, the suppression of habitual discharges, obstructive disease of the heart, disease of the kidneys, &c. Of the predisposing causes, by far the most important are those which favour fatty or atheromatous disease in the coats of the blood vessels, whereby they are easily ruptured; of such causes, the too free use of alcoholic liquors, want of sufficient exercise and luxurious living, are the most efficient. At the same time a diet not sufficiently nutritious and excessive labour may conduce to a similar result.

The more common exciting causes are intoxication, sudden and violent exertion—as straining at stool—exposure to great heat or cold, violent mental excitement, a full and overloaded stomach, &c. It may, indeed, be summed up a in few words, that everything which interferes with the circulation of the blood within the head, whether by accelerating or retarding it, is calculated to cause apoplexy.

Diagnosis.—Apoplexy requires to be distinguished from insensibility caused by excessive drinking or a narcotic drug, and by concussion of the brain. This is often difficult or impossible. The smell of liquor in the breath, or in matters vomited will sometimes afford useful information; and in concussion from injury, a wound or contusion can often be discovered. But in the absence of these, and the want of information as to how the attack originated, it will be very difficult, if not impossible, at all times to make the distinction.

Prognosis.—It need scarcely be said, that apoplexy is a dangerous disease. Recovery from a first or single attack it is true is not uncommon, but permanent recovery is very rare, though now and then this has been recorded. The most unfavourable symptoms are a cold clammy skin, a frequent and irregular pulse, continuance of coma for more than twenty-four hours, general paralysis, &c.

There is so much variation in the pulse, respiration, and appearance of the face, that it is necessary to notice these symptoms somewhat more in detail.

Pulse.—The pulse is sometimes full and hard, and often slow, but it may be small and compressible, or irregular and intermitting.

Respiration.—The breathing may be quite calm and placid, but not unfrequently it is accompanied by a snoring noise (*stertor*), which seems to depend upon paralysis of the muscles of the *velum pendulum palati.* At times there is flapping of the cheeks, from the power of contraction being lost in the buccinator muscle. The state of the respiration is not a measure of the severity of the attack, being sometimes, in the most severe cases, quite calm.

Face.—The face is sometimes flushed, swollen, and livid, but is often pale.

Treatment.—When premonitory symptoms are present, much may often be done to prevent the attack. The patient should avoid any sudden or violent exertion, or any source of excitement. The stomach should never be overloaded, and constipation of the bowels should be removed. Plethora must be reduced by abstemious living and exercise, and if necessary by evacuants. The diet should never be large in quantity nor stimulating. He should take free exercise in the open air. All constrained or stooping postures should be avoided, and he should be careful not to wear any article of dress which obstructs the flow of blood from the head. Violent mental emotion and excitement should be especially guarded against, and the bowels carefully regulated. When the premonitory symptoms, as throbbing, giddiness, &c. indicate that an attack of apoplexy is impending, general bleeding may be required.

If at the time of the attack the face and neck are full and turgid, the patient should be immediately bled; but if, as often happens, the face is pale, the skin cold, and the pulse barely perceptible, an opposite line of treatment is indicated: heat should be applied to the extremities, and a bottle containing ammonia held to the nostrils, and should the patient retain the power of swallowing, ammonia or a little brandy and water may be given. If deglutition is impossible, an injection with an ounce or two of turpentine should be administered. The head must be well raised and cold applied.

Between these extremes we meet with numerous cases wherein, at first, neither bleeding on the one hand nor stimulants on the other are indicated. Treatment in such cases should not be too meddlesome; cold may be applied to the head and sinapisms to the calves of the legs. If the attack continues, blood may be cautiously drawn, or stimulants administered according as the tendency to death is by coma or syncope. In all cases of apoplexy, purgatives are useful; calomel and jalap, or castor oil and turpentine may be given; and when the power of swallowing is lost, a drop or two of croton oil may be placed upon the tongue.

CEPHALALGIA.—*Functional headache.*—Headache is a prominent symptom of organic disease of the brain, but often occurs when that organ is healthy, and is then said to be *functional.* The pain may be acute or dull; superficial or deep-seated; diffused or circumscribed; and accompanied or not by abnormal sensations—as drowsiness, wakefulness, noises in the ears, &c.

Functional headache is most common in females, and especially in hysterical females, or when the uterine function is deranged. It is also sympathetic of gastric derangement in both sexes. Sedentary occupations, too close mental application, or anxiety of mind often brings it on, and it can frequently be related to plethora and anæmia. In many cases it is hereditary. Indulgence of the passions, errors in diet, or the abuse of alcoholic liquors often induce it. There are several varieties of headache.

Congestive headache.—Headache is often due to derangement of the circulation within the head, and is therefore a frequent accompaniment of plethoric and anæmic states. When it occurs in plethoric persons, there is, in general, complaint of giddiness and noises in the ears, and the pain is aggravated by stooping.

Nervous headache is perhaps the most common of all its forms, and cannot in many instances be traced to any special derangement. It varies much in the frequency of its attacks, comes on suddenly and irregularly without any apparent cause, and as suddenly takes its departure. Sometimes the pain is periodical and confined to one part of the head—generally the front part (hemicrania)—and is then for the most part connected with malaria, hysteria, or anæmia.

Bilious or sick headache seems to arise from derangement of the stomach. The pain is very severe, at times almost intolerable. It may be general, but more frequently is limited to one eye-brow. Deep-seated pain is sometimes felt in the globe of the eye. Nausea is often present, and the pain is always relieved by the vomiting of a small quantity of bilious fluid. The duration of sick headache varies from a few hours to a day or two.

Rheumatic headache is that which occurs in association with rheumatism. The pain is external, and there is usually at the same time tenderness of the scalp.

Very severe headache is sometimes felt in syphilis, due, no doubt, to the fibrous structures in relation with the bones of the cranium being inflamed. It is important to distinguish functional headache from that which is due to organic disease of the brain. The short duration of the attacks, the absence of derangement of the nervous function, the possibility in many instances of tracing the cause of the attack, its habit of recurrence, and not unfrequently of periodical recurrence, and the entire freedom from it during the interval, will in general be sufficient to enable diagnosis to be made.*

Treatment.—In regard to treatment a few words will suffice. The cause must be sought for and if possible removed; plethora and anæmic states must be corrected, and malarious influence met by its antidote—quinine. Functional derangements of the stomach and uterus should if possible be removed, and the rheumatic and syphilitic diathesis duly treated. The patient should avoid too close mental application, and take sufficient exercise in the open air. The bowels should be regulated, and the secretions generally attended to. In nervous or sick headache, the pain may sometimes be relieved by a slight stimulant—as sal volatile, a cup of strong coffee or tea, &c.

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* Headache, with frequent vomiting continuing for several days, should always excite the suspicion of meningeal inflammation.

DELIRIUM TREMENS. *Delirium of a peculiar kind caused by the abuse of alcoholic liquors.*

Delirium tremens prevails more or less in all countries where alcoholic liquors are used in excess, and is frequently met with in India amongst the lower classes of Europeans; but is rare in Natives. Much confusion has been caused by classing with delirium tremens derangements produced by hard drinking, of which delirium is no part. The definition given above indicates the sense in which the term will be used in this work.

Symptoms.—The prominent symptoms are delusions and hallucinations, sleeplessness, and tremors.

The attack either sets in suddenly in persons who are not habitually intemperate, but who have indulged in a bout of hard drinking, or more gradually in the habitual drunkard. This has led to the division of delirium tremens into two species.

1*st Species.*—In the first species, which is by far the least common, but most dangerous, there is delirium—often violent; the face is flushed, the pulse frequent, and the tongue coated in the middle, but florid at the tip and edges, and the stomach is often so irritable, that food and medicine are rejected. In the advanced stage convulsions may occur, followed by coma or death; or the symptoms may pass into those of the second species now to be described.

2*nd Species.—Symptoms.*—There are often premonitory symptoms extending over a longer or shorter time, and which are by some authors considered as the first stage of the disease. Thus, after long-continued drinking, there may be great depression of spirits, disturbed sleep, forgetfulness, dreams, loss of appetite for food, tremulousness, irritability of stomach, &c. This state, familiarly known as "the horrors," often passes off without any further symptoms, but more frequently the patient begins to have delusions and hallucinations, at which time the attack of delirium tremens may be said to have commenced. There is now great excitement; the face is wild in expression and indicative of fear; there are constant tremors of the muscles, and the tongue when protruded is tremulous; the skin is clammy and often covered with a copious perspiration, which has an offensive smell. The pulse is sometimes frequent, but soft and easily compressible, the tongue coated, the appetite lost, and the bowels constipated. There is complete loss of sleep, and the pupils are dilated.* The patient's manner is agitated and precipitate. If told to do anything, he makes the attempt in a hurried and ineffectual manner. But the most notable symptom is delirium, which is busy and active, hallucinations and delusions being the most striking features. These are almost always connected with that which is terrifying: the patient fancies he sees hideous objects, demons of all kinds, or that people are conspiring to injure or kill him, or that loathsome animals are creeping over his person. And not only does he see strange and frightful objects, but he hears strange and awful sounds: the sense of hearing being as much deranged as that of vision. He is not in general violent, or if he is so, it is in self-defence. He does not wish to injure others, but sometimes thinks himself constrained to act on the offensive, in order that they may not injure him. Sometimes, indeed, his alarm is so great, that he commits or attempts to commit suicide, in order to escape from his supposed persecutors. And with all this, there is something even more remarkable about the delirium. If firmly and decidedly spoken to, the patient is for the moment sensible of what is said to him, and will readily do, or attempt to do, what he is told, but he soon relapses into his former state. For many hours, or for several days and nights, he has no sleep nor even rest, for his loquacity and restlessness are such that he scarcely ceases even for a moment from talking and moving about. Any attempt to control him by personal restraint is strongly resisted, and adds to the delirium and excitement.

Progress.—After the symptoms just described have existed for from one to three or four days, one of two things happens: the patient falls into a sound sleep, on awaking from which he is convalescent,* or the symptoms which characterise what has been called the third stage make their appearance, and which often indicate a fatal termination. These symptoms are a sunken and haggard face, a brown and dry tongue, dilated and immovable pupils, low muttering delirium, convulsions and coma. It must not be supposed that sleep is the cause of the improvement, more probably it is merely the result of the attack having ceased.

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* In regard to the state of the pupils, there has been much difference of statement. I believe the question is finally set at rest by Dr. Leith's very careful observations.—*Transactions of the Medical and Physical Society of Bombay, No. VIII., New Series.*

Dr. Morehead states, that in some instances, after the symptoms of delirium tremens have continued for some time without sleep, the pulse begins to increase in frequency, rising above a hundred, and becoming more compressible. The skin is damp, the expression of countenance vacant, and the pupils begin to contract. The twitchings increase and assume more the character of *subsultus tendinum* than in the earlier period of the disease, and the patient catches at objects, not so much apparently from fancying them present when not so, as from miscalculating the distance when they really are before him. Dr. Morehead believes, that when such symptoms are present, there is danger of the sudden occurrence of coma, or of the supervention of the symptoms, which have been above described as constituting the third stage. The occurrence of convulsions indicates great danger, and they are often preceded and accompanied by unusual dilatation of the pupil.

Pathology.—Morbid anatomy has thrown no light upon the pathology of delirium tremens. Alcohol has been found after death in the cerebral fluids, and the membranes of the brain and the brain itself are unusually congested and vascular. The lungs and lining membrane of the stomach and the liver are often congested, and the latter is not unfrequently fatty.

The symptoms of delirium tremens are doubtless due to the toxæmic effect of alcohol upon the substance of the brain, but of the nature of the influence exerted we are quite ignorant. One important point to be remembered is, that a certain time is required for the poison to be eliminated. In tropical countries, delirium tremens is in some instances associated with determination of blood to the head from exposure to the sun, or with meningitis. The first species is also in many instances complicated with gastritis.

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* Dr. Leith's observations in the European General Hospital, Bombay, show that *complete* recovery after a short sleep is not so general as has been supposed. In a considerable number of cases, when the sleep had not been very prolonged, although the hallucinations and delusions were lessened, or for a time had even passed off, the delirium returned, and sometimes with increased severity.—*Transactions Bombay Medical and Physical Society, No. VIII., page* 112.

Cause.—The cause of delirium tremens is the continuous and excessive use of alcohol in some form or other. Symptoms somewhat similar have been induced by the use of opium, by too close mental application, &c. but they are rare. It was at one time thought, that the attack was often immediately excited by the withdrawal of the stimulus, but this view is now known to be erroneous. Nevertheless, when there is much debility, and the use of alcohol has been long habitual, its sudden withdrawal may sometimes favour the attack, by leading to depression of the action of the heart, just as in the habitual drunkard any shock to the system, as a severe injury, over fatigue, mental depression, &c., may immediately cause it.

Diagnosis.—Delirium tremens may be distinguished from inflammatory affections of the encephalon, by the peculiarity of the delirium, the tremors, the perspiring skin, the soft and easily compressible pulse, and perhaps also by the dilated pupil.

Prognosis.—Delirium tremens is a serious disease, although under proper treatment the greater number of cases do well.

Treatment.—In the first species, which is often associated with cerebral determination, leeches may in robust persons sometimes be applied to the temples, the cold douche freely used, and should there not be irritability of the stomach, antimony, in doses of from one-third to one-fourth of a grain, combined or not with small doses of opium, administered every three or four hours. The treatment of the second species is the most important, on account of the frequency of its occurrence. In must not be forgotten that time is necessary, in order that the alcohol may be eliminated; any attempt to cut short the attack, is almost certain to result in failure. Two objects require to be carefully attended to, viz. to secure perfect quietude for the patient, and to administer nutriment. When possible, the patient should be placed in a room from which noises of all kinds are excluded. It should contain nothing with which he can injure himself; an attendant should be at the door of the room, through which there should be a small aperture to permit him to see what is going on inside. As a general rule, no one ought to be in the room with the patient; but sometimes the suicidal tendency is so strong, that restraint is necessary to prevent him from dashing his head against the wall. This can be best effected by an attendant remaining in the room. Personal restraint by strait-waistcoats or other means is ill borne and often dangerous. Food should be regularly and systematically given in the form of milk, or beef-tea, or chicken broth, or in a solid form if the patient can be induced to take it. In by far the greater number of cases, stimulants should be entirely withheld. When the delirium is violent, and the restlessness great, benefit is derived from small doses of tartar emetic, combined with from ten to twenty minims of tincture of opium, and repeated every three or four hours. The cold douche is also useful. Although, as a general rule, stimulants are not to be given, yet in cases where the heart's action is much enfeebled, they are indicated.

The "cold douche" may be used three or four times in the twenty-four hours, when the pulse is not very feeble or the skin coldish; and it is sometimes advisable, at the time it is being employed, to cause the patient to stand in a warm pediluvium. If the disease has passed into the third stage, a blister should be applied to the nucha and mild stimulants given.

Of late years, large doses (℥ss) of the tincture of digitalis have been given in delirium tremens, and it is said with marked benefit. Believing, as I do, that the treatment above indicated is the best for this disease, and that when followed it will generally be successful, I am unwilling to adopt or recommend the use of a drug, the effects of which are uncertain and may be dangerous.

EPILEPSY.—*Falling sickness—paroxysmal attacks of convulsions, with loss of consciousness, and afterwards coma.*

Epilepsy is so remarkable and even terrible in the phenomena it presents, as to have attracted attention from the most remote periods. Full descriptions of it are to be found in the works of the oldest writers.

Symptoms.—The symptoms of a fit or paroxysm stated shortly, are clonic spasms, hurried and difficult breathing, and loss of consciousness.

The attack is often sudden, but may be preceded by a peculiar sensation or sensations, by which the patient is warned of its approach. The kind of sensation varies in different persons, and even in the same person at different times. It may be headache or giddiness, drowsiness, loss of sight, mental illusions,, &c. or it may be merely some unusual state of the mind or temper, as fidgetiness, lowness of spirits, peevishness, &c. Sometimes the face becomes flushed or pallid, and the speech impaired. In many instances the sensation originates in the body or extremities, and mounts upwards to the throat and head. It is then known as the "aura," under the belief, once entertained, that it is similar to the effect produced by a breath of air. But of the many sensations described by patients suffering from epilepsy, this appears to be the least common. It is more often likened to the creeping of insects (*formication*) or the trickling of water. The premonitory symptoms may continue for several hours or days, but very generally their duration is but for a few minutes. Whatever the *aura* may be, so soon as it reaches the head or throat, the fit commences: the patient suddenly falls to the ground, and in many instances with a shriek or cry so shrill and terrifying, that once heard it is never forgotten. There is entire loss of consciousness; the limbs and body are violently convulsed; the face is horribly distorted; the eyes are turned up and blood-shot, and the pupils dilated and insensible to light; the tongue is thrust between the teeth, and often severely wounded by spasmodic closure of the jaw; frothy saliva is forced out from between the lips, and not unfrequently the urine and fæces are discharged. The breathing is at first hurried and afterwards laboured, and should the attack be prolonged, the signs of impending apnœa set in. At length, in from five to fifteen minutes, the spasms begin to subside, consciousness is restored, and the fit is over, but considerable drowsiness remains, and the patient often falls into a deep sleep, on awaking from which he appears to a casual observer to be quite well.

This is the usual course, but there is much difference as to the after-effects of an epileptic fit: one patient will recover almost immediately; another, after becoming conscious, will fall into a deep sleep, whilst some do not become conscious at all, but remain in a comatose state for hours or even days, on recovering from which they may be idiotic or paralytic.

The frequency with which the fits return is also subject to much variety. A single fit may be both the beginning and end of the disease; or there may be a fit after an interval of one or several years. Usually, however, at first there is an interval of a few months, but this is gradually diminished, until the attacks recur daily or even hourly.

It is doubtful if epilepsy ever exhibits a periodical tendency; but the fits are more common in the night than in the day.

Many of the symptoms just described, though they may be all present in a typical case, are often absent: consciousness is not always entirely lost, and the convulsions, in place of being general, are sometimes confined to a single set of muscles—the muscles of the neck are often in a marked degree affected. So also the spasms may be rather *tonic* than *clonic*. Although the tongue is frequently wounded, it probably escapes injury in at least half the cases, and therefore the absence of this symptom is not a negative sign of much diagnostic importance.

During the interval between the fits, the patient is never perhaps entirely well: the mind is not quite clear; there is often difficulty in connecting the thoughts; there are occasional attacks of vertigo and headache, and sometimes muscular twitchings or spasmodic contractions. The digestion is deranged, and the bowels are constipated. The pupil of the eye is said to be dilated.

After the disease has existed for some time, the intellectual faculties begin to fail, the speech is impaired, and the expression of the face idiotic. In this condition the patient may live for a longer or shorter time, or he may be suddenly carried off by apoplexy or by apnœa in the course of a violent fit.

The symptoms just described are those of the severe form of epilepsy, but there is a mild form, in which there is transient loss of consciousness, and a feeling of giddiness, without spasms. "A fixed gaze, a totter perhaps, a look of confusion; but the patient does not fall." This is often called *epileptic vertigo* to distinguish it from the *epileptic fit*. And between this very mild and the severe form, there are intermediate grades of severity:—the patient, instead of suddenly falling and struggling violently, may slide or sink down, and remain for a time insensible but not convulsed.

Causes.—The causes of epilepsy are but little understood. It is believed to be more frequent and severe in males than in females, and to be most common about the second dentition and at the period of puberty, although it often occurs in infancy and occasionally in advanced age. There is no question of the influence of hereditary predisposition. From the derangements that are present in the intervals between the fits, it is probable that a state of debility, however induced, may afford a predisposition to the disease. The predisposition given by disease of the kidney is well known. There is also a connection between epilepsy and the condition of the generative organs both in males and females: excessive venereal indulgences, and derangement of menstruation have often preceded epileptic attacks. Epilepsy appears to be sometimes related to an unnatural shape of the head, "which is pinched up like a sugar loaf, or mis-shapen, or unsymmetrical, one half being unlike the other; or in some way or other oddly configurated." Of late years a connection between epilepsy and syphilis is believed to have been traced; but in my opinion, more facts are necessary before this connection can be considered to have been established.

The exciting causes of epilepsy are often mental; as fear, grief, joy, and the like. And these are more operative upon females than males. But sometimes more tangible causes can be discovered; as inflammation or injury of the brain and its membranes, pressure upon the brain, as by a bony growth from the inner surface of one of the cranial bones, the suppression of cutaneous eruptions or of habitual discharges, irritation of the intestines from worms, or of the gums during dentition, disease of the uterus, stone in the kidney or bladder, &c.

Pathology.—There are no morbid appearances with which epilepsy can be essentially connected. It is quite true, that when persons die of epilepsy, the brain and various organs are in some cases diseased, but in others every viscus is to appearance quite healthy. The brain may be indurated and injected, or the white matter soft and flabby. The blood vessels have generally been dilated. In many instances there are the appearances of meningitis. Many organs—the liver, kidneys, and uterus—have been found to be diseased in epilepsy, but what, or whether any relation exists between such visceral diseases and the epileptic seizure is not known.

The real nature of epilepsy is therefore but little understood. That the derangement is mainly in the brain, is evident from the more or less complete loss of consciousness; but it may extend to the spinal cord, or, on the other hand, it may originate in the spinal cord and extend to the brain. It is also certain that some kind of impression being conveyed from the periphery of a nerve to the centre, will, in those who are predisposed, excite an attack. This has led to epilepsy being considered as of two kinds, viz. *centric* and *eccentric;* but the distinction, though of practical importance, is not so much in the nature as in the cause of the disease.

What that exact condition of the nervous matter may be upon which epilepsy depends, we do not know. That it is often brought about by derangements in the circulation of, or in the blood itself, is certain. This is proved by the effect of compression of the blood vessels distributed to the brain, and by the frequency with which renal disease is associated with epilepsy.

There can be no doubt, that the first link in the chain is an undue degree of excitability in some part of the nervous centre, whereby it responds to impressions conveyed to it more quickly and energetically than under ordinary circumstances. The impression may originate in one part of the nervous centre and be conveyed to another part, or it may be transmitted from the peripheral extremities of various nerves. In this way mental emotions and various local diseases and irritations may be causes. There is ground for believing that the impression is transferred to *vaso-motor nerves,* whereby the circulation of the blood in the nervous centre is altered.

When once induced, the fits are often kept up by habit; that is, the frequent occurrence of the attacks seems to favour their continuance, and this is in accordance with a general law which is more or less familiar to all persons.

Diagnosis.—The disease which epilepsy most resembles is hysteria. By attending to the following circumstances, a correct diagnosis may be made: in hysteria there is not complete loss of consciousness, nor is there the shrill cry which occurs at the commencement of the epileptic fit. The hysterical fit is not followed by deep comatose sleep; and during the fit the tongue is not bitten. The breathing in hysteria, though rapid and sobbing, is not embarrassed as in epilepsy. In hysteria there is the *globus hystericus,* which is never present in epilepsy.

Prognosis.—The prognosis in epilepsy is usually unfavourable; but if a peripheral or eccentric cause, which is susceptible of being removed, can be discovered, then, of course, hopes of cure may be held out. But even in this case, should the disease have been of long standing, the prospect of cure is not very great.

Treatment.—During the fit.—The patient should be so placed as that he may not injure himself; his clothes should be loosened, and especially those about the neck. The head should be raised, and cold cloths applied to it. Little more can be done during the paroxysm. It should however be mentioned, that some persons believe the attack to have been shortened by compressing the carotid arteries.

During the interval.—General derangements of all kinds should if possible be removed, and especially plethora and anæmia. The latter condition is by far the most common, and consequently it is generally necessary to promote vigour and strength by nervine tonics, as the preparations of zinc or iron. The diet should be nutritious, but not stimulating, and regular exercise should be taken in the open air; mental excitement should be carefully avoided. Whether in ordinary cases much more can be done is very doubtful; but many medicines have occasionally been used with advantage: as turpentine, valerian, æther, musk, camphor, sumbul, the cotyledon umbilicus, &c. Benefit is said to have been derived from belladonna, and from the application of the actual cautery to the part from which the aura appears to proceed.

It need scarcely be said, that all parts of the body should be carefully scrutinised in order to detect any local irritation that may be present, and if any such should be found, it must of course be removed. As we cannot ascertain what may be contained in the intestines, aperients and anthelmintics may be used in the commencement of the treatment. Should there be reason to suppose that the attack is connected with syphilis, iodide of potassium or a mild course of mercury may be tried.

It is believed, that when there are premonitory symptoms, a fit may sometimes be prevented by occupying the mind, or by a stimulant—as ammonia—applied to the nostrils. When there is an "aura" proceeding from one of the extremities, a ligature tied tightly round the limb has been successful in preventing the fit, and in order to bring about a permanent cure, a limb has been amputated, or a testicle removed when the aura proceeded from those parts; but not with sufficient success to justify the adoption of such desperate remedies.

Dr. Marshall Hall recommended tracheotomy, under the idea that closure of the glottis is one of the most prominent features of the fit. The operation has been performed in a few instances, but not with such results as to warrant an opinion in favour of the practice being expressed.

HYSTERIA.—*A convulsive disease, connected with emotional excitement.*—Hysteria presents itself in so many different forms, that it is scarcely possible to offer a satisfactory definition of it. That given above, although obviously very defective, may serve to direct attention to some of its main features. It is a common disease amongst females, and prevails to an unusual extent in the Parsee community of Bombay, but is much less frequently seen amongst Native Christians, Hindoos, and Mussulmans.

Symptoms.—Hysteria may occur as a well-marked convulsive paroxysm, or be chiefly apparent in a state of morbid derangement which may simulate other diseases; or, lastly, it may manifest itself by stamping a peculiar character upon any disease that may be present.

The symptoms of the "hysterical paroxysm" are in some respects not unlike those of epilepsy: the patient falls to the ground and struggles violently, requiring to be held; but the face is not distorted, and the breathing, though hurried and gasping, is not laboured or suspended, there being no spasmodic closure of the rima glottidis. The kind of convulsion is also different: the patient throws herself into almost inconceivable attitudes; sits up, and then throws herself on the floor or bed; beats her breast or tears her hair. There is not complete loss of consciousness, and there are fits of crying or screaming. The convulsions cease and recur at short intervals, until the attack passes off with crying and sobbing, or laughter. The attack may last from a few minutes to several hours or even days. The paroxysm is often preceded by various nervous derangements, and by the sensation of a ball rising up into the throat, technically known as the "globus hystericus."

There are many varieties of the hysterical paroxysm: in mild attacks there is merely a feeling of distress, with a sense of choking, and fits of crying or laughter. The patient at other times may be insensible and remain so for many hours, without convulsions; or there may be spasms which are more *tonic* than *clonic* confined to a single set of muscles. Thus, the jaw is sometimes firmly closed or an extremity flexed, or articulation or deglutition suspended. The frequency of the attacks is quite uncertain. There may be several in one day, or none for weeks or months; but they are more frequent at the menstrual than at any other period. In the intervals between the attacks, or even when there has been no distinct paroxysm, there is a state of morbid sensibility, in which there may be some of the symptoms of inflammatory disease. For example, there may be acute pain of the abdomen, as in peritonitis, or of the chest and hypochondria, as in pleuritis, hepatitis, &c. The spine may be tender, or there may be pain and tenderness in the extremities. The pain is due to morbid sensibility of the muscles, and when situated over an organ, can be distinguished from inflammatory pain by its superficial nature, by the absence of fever, and by the history of the attack.

But besides the diseases that may be simulated in consequence of increased sensibility, there are many others which do not admit of this or perhaps any explanation. Paralysis of both motion and sensation have been often observed—sometimes to such an extent as to give rise to hemiplegia. It is well to notice, that this false or spurious hemiplegia is unattended by many of the usual symptoms of true hemiplegia, and that it occurs and disappears suddenly. Dr. Todd has pointed out a distinction which, if true, is very inportant, viz. that in hysterical hemiplegia the paralysed limb is dragged, whilst in true hemiplegia it performs, as is well known, a motion of circumduction. Of particular diseases that may be simulated by hysteria, there is indeed a long list. It is probable that there is scarcely any disease of which hysteria has not assumed the characters; of those most frequently noticed, laryngitis, stricture of the œsophagus, hæmatemesis, rheumatism, colic, diarrhœa, disease of the joints or of the spine, paralysis of the bladder, malarious hemicrania, may be mentioned.

The state of the mind and disposition is sometimes very remarkable in hysteria. From a morbid desire for sympathy, or from an irresistible impulse to deceive, the most extraordinary attempts are sometimes made by hysterical patients to impose upon those about them. Some pretend that they are unable to evacuate the urine, and should the deceit not be detected, and the catheter be introduced every day, the retention continues, but if left for a time, the urine in general passes. Others have been known to introduce pieces of stone into the vagina and urethra, and declare that they were suffering from calculous disorders. In short, there is scarcely any act, however revolting, from which hysterical girls will shrink in some forms of this miserable disease.

Lastly, the hysterical state or diathesis may operate in giving undue prominence to the symptoms of any disease that may be present, and consequently, if this is not borne in mind, we may be led to over-estimate the severity, of what, indeed, may be very slight affections. But whilst we are careful not to be misled on one side, we must be equally careful not to be misled on the other: we must not under-estimate the importance of the *real* symptoms, under the belief that they are exaggerated by the hysterical diathesis.

Of particular and distressing symptoms in hysteria, hiccup is one of the most marked. Flatulent distension and belching are also often very annoying. In many instances there is a hard ringing, stridulous cough, not unlike that in croup or hooping cough. Some hysterical patients lose their voice for days together, and others cannot swallow. Some have dyspnœa in paroxysms, as if they were suffering from spasmodic asthma. Palpitation of the heart and irregular arterial pulsations are not at all uncommon. Of deranged secretions, that of the kidney is the most frequently observed: the urine may be excessive in quantity, pale and limpid, or so scanty as to be almost suppressed.

Of the progress of hysteria little can be said, as it is almost as capricious and uncertain in this respect as it is in the symptoms it presents. Sometimes the attacks become less and less frequent, until they cease altogether; at other times they cease suddenly in consequence apparently of some change of life, which exercises a marked influence upon the moral nature. In many, perhaps in the majority of cases, they continue throughout the patient's life; but however long the hysterical state lasts, the nutritive function is seldom impaired, and it is not dangerous to life.

Causes and pathology.—Hysteria is attributed to excitability of the nervous system, which is sometimes hereditary, but may be acquired by exposure to those circumstances which lower the tone of the system, and by want of proper regulation or undue excitement of the emotional feelings. The connection between hysteria and the generative function is well known: derangements of the uterus, or undue excitement of the genital organs in either sex, are known to produce it.

When the excitability above referred to exists, the hysterical paroxysm may be produced by very slight exciting causes. Emotions of the mind, fear, joy, grief, disappointment, &c. often excite it. Seeing another person in a paroxysm will often bring on an attack. But in many instances no cause can be traced; when the excitability is excessive, the exciting cause will be so slight and transient, as in most cases to escape observation. The much greater frequency of hysteria in the female than in the male sex, and its aggravation or more frequent occurrence at the menstrual periods, have led to the opinion that the seat of the derangement is in the uterus. But hysteria *does* occur, though rarely in men, and in women when the uterine function is quite healthy. The pathology of hysteria is yet to be discovered, and I think it is better to state this at once, than to repeat the various speculations which have been given, and which only serve, if they even do that, to hide our ignorance.

Diagnosis.—The diagnosis between the epileptic and hysterical fit has already been stated at page 426. In distinguishing the diseases simulated by hysteria from real diseases, the following points may be remembered:—1. The disproportion between the local and general symptoms. 2. The absence of that expression of anxiety and alarm upon the face which severe organic disease produces. 3. The capricious and varying nature of the symptoms. 4. The superficial character of the pain that is present. 5. The history of the patient as regards the previous occurrence of hysteria.

Treatment.—As in epilepsy, it is requisite to distinguish the treatment of the fit and of the interval. During the fit, care must be taken lest the patient injure herself by the violence of her movements; her clothes should be loosened, and she should be placed in a free current of air. Smelling salts may be applied to the nostrils, and cold water sprinkled over the face. If the fit continues, an assafœtida or a turpentine enema may be administered, sinapisms applied to the extremities, and cold to the head. In some instances the fit is checked by making a strong impression on the mind, as by proposing in the hearing of the patient to have recourse to some severe and disagreeable remedy, as shaving and blistering the scalp, &c. The treatment in the interval consists in removing any derangement that may be present, and improving the general health by every possible means, both regimenial and medicinal.

CHOREA.—*Saint Vitus's dance; irregular muscular contractions, partially under the influence of the will, and without loss of consciousness.*

Chorea is a rare disease in Western India, and perhaps also in other tropical countries. It is almost confined to early life and is much more common in girls than boys.

Symptoms.—It commences with irregular contractions of the muscles of the face, shoulders, and hands, which afterwards extend to other muscles. The movements produced are often grotesque or even ludicrous. When any movement is attempted, the muscles at first appear to be under the influence of the will, but before it is completed, some other influence is interposed, and they are completely withdrawn from its control. If the patient wishes to raise her hand to her mouth, she can partially succeed, but at the moment perhaps, when her purpose is about to be accomplished, the hand is suddenly drawn back or turned in some other direction. The muscles of the face are in constant action, and the features so twisted and distorted, that the most extraordinary grimaces are produced. And not only are the muscles of the face affected, but those of the extremities are in a similar condition: the hands and feet are never quiet.

Many ordinary muscular acts are also imperfectly performed, as speaking, walking, &c. There is no febrile derangement, and the nutritive functions may not be interfered with; but very often the appetite is capricious, the bowels constipated, the tongue furred, and the abdomen tumid. The age at which chorea most commonly occurs is between 8 and 16 years; but it may begin earlier, or even in adult life. It is rarely fatal; its duration is from a week or two to several months.

Causes.—The predisposing causes are little known. The tendency to chorea is sometimes hereditary. Age and sex also exert some influence, the disease being, as already mentioned, most common in young persons, and rare in infants and old persons. Females are more frequently the subjects of it than males, in the proportion of three to one. It is thought that the changes which occur during the second dentition and at puberty predispose to chorea.

From the little prevalence of chorea in tropical countries, the opinion has been entertained, that cold is in some way a predisposing cause, but this is very doubtful. The frequent occurrence of chorea in weakly debilitated children would seem to point to anæmia as a cause. A remarkable connection between acute rheumatism and chorea has long been recognised. The exciting causes are, powerful mental emotions, especially fear, &c. various peripheral irritations, as inflammation of the gums during dentition, intestinal and hepatic derangements, suppression of the menses and of cutaneous diseases, &c.

Pathology.—That chorea is a disordered condition of the brain, but which cannot be traced to organic change in that organ, is nearly all that is known of its pathology. The association of chorea with acute rheumatism has been the basis for speculations as to its being due to an altered state of the blood.

Treatment.—In all cases we should seek for peripheral irritations, and if possible remove them. The bowels should be freely acted upon, but afterwards purging should not be kept up, lest it debilitate the patient. Attention should be paid to the state of the functions generally, and especially to the uterine and hepatic functions. During dentition, the condition of the gums must be carefully examined. Any indications of the existence of worms should lead to the use of anthelmintics. If there should be plethora and cerebral congestion, a few leeches may be applied to the head. After local sources of irritation have been removed, or should none be found, measures must be adopted which are calculated to give tone and vigour to the system. Cold or sea bathing, exercise in the open air, and a tonic regimen are indicated. Various tonic remedies and nervine stimulants may be administered; those generally employed are iron, zinc, arsenic, valerian, and assafœtida. Dr. Wood speaks highly of the black snake-root. Antispasmodics, as musk, camphor, sulphuric ether, &c. have sometimes been useful. Various narcotic and sedative remedies are also said to have been sometimes given with benefit.

HYDROPHOBIA. RABIES.—*A paroxysmal convulsive disease, caused by the bite of a rabid animal.*

There are animals—generally carnivorous—which, in certain states of disease, form or generate a poison which, being introduced by inoculation into the blood of man, produces the most serious or even frightful effects.

The phenomena or symptoms caused by this poison are grouped together, and held to constitute a special disease, which is named "hydrophobia" or "rabies."

Symptoms.—The prominent symptoms are spasms of the muscles of the throat; great nervous irritability and excitement; a dread of fluids; the secretion of tenacious matter which adheres to the fauces; and an altered condition of the mind.

The symptoms of hydrophobia do not follow immediately upon the introduction of the poison, nor indeed for several weeks or even months. During this time, there is in general an entire absence of derangement; the wound heals as readily as any other wound, and if there has not been reason to suspect that the animal was rabid, the fact of its receipt may be almost forgotten. This is the period of incubation, and, as before mentioned, it may be prolonged for many months, but in by far the greater number of instances, it lasts from one to three months.

Mode of commencement.—Before the disease is fully established, there are premonitory symptoms, as restlessness, depression of spirits, chilliness, and loss of appetite; or the sleep may be disturbed, the patient suddenly awaking in great alarm. In some instances uneasy sensations are felt in the bitten part, notwithstanding that the wound may have healed, and these sometimes extend along an extremity to the throat. Within a few hours or a day or two, the restlessness increases in paroxysms, and there are spasmodic contractions of the muscles of the throat, with difficulty in swallowing, especially fluids; and the paroxysms, as the disease advances, are excited by a current of air, or an attempt to swallow, or even by the thought of swallowing. The further symptoms and progress of this disease will be sufficiently illustrated by the following cases:—

A Purwarree, a horsekeeper, about 33 years of age, was admitted into the Jamsetjee Jejeebhoy Hospital about 3 o'clock in the afternoon of the 11th September 1848. It was stated by his wife, who accompanied him, that he had just landed from a boat, which arrived on the morning of the same day from the Gulf of Cambay; that he had been taken ill on the passage two days previously, but that he had only been in his then condition since the preceding night. When first seen, almost immediately after admission, he was sitting on the end of a cot, with both his hands pressed against his ears, as if to exclude the least noise. His head was bent forward, and his eyes fixed on the ground; and when spoken to, though quite sensible and capable of answering questions, he could not be made to look up. The attempt to remove his hands seemed to give him great distress; he resisted with much determination, and declared his head was full of wind. Although sensible, he was disinclined to speak, unless pressed to do so, but his answers were quite rational, and he declared he had no idea of the cause of his present illness. His face was expressive of great suffering; the skin covered with cold moisture; and the pulse feeble and rapid. The disinclination to speak seemed to arise from the distress which the effort occasioned him; his articulation was interrupted by deep sighs, and the utterance of each word was attended with a sort of shudder. His wife declared he had taken neither food nor water for two days. Whilst questioning the patient, a small quantity of thickish-looking saliva was seen adhering to the corners of his mouth, and a large quantity was noticed on the ground under him. A dose of the Hospital diaphoretic mixture was ordered to be brought; when told that he must take the medicine, he removed his right hand from his head, seized the vessel, and by apparently a desperate effort, poured the contents into his mouth. In an instant he spat them out, jumped from where he was sitting, and ran towards the end of the ward. He was led back to his seat. He came quietly and made no remark. His wife was now questioned as to whether he had been at any time bitten by a dog. She denied that he had ever been bitten. A small cup of water was brought to him, and he was told that it was water for him to drink. At first he took no notice, but on being told to drink the water, he glanced for a moment at the cup, and instantly sprang into the middle of the room several feet from the cot. He then, as before, ran towards the end of the ward, but with stronger marks of terror, apparently fearing that he should be pursued with the water. After two or three minutes he returned voluntarily to his seat, but made no remark. He was now told to look up. At first he appeared unwilling to make the attempt, as if moving the head gave him pain. At length, however, he raised his head, but only for a moment, as the movement seemed to be attended with great suffering. Whilst making the attempt to raise the head, twitches of the muscles of the neck were observed. His wife was again questioned, and again denied that he had ever been bitten by a dog. He was now removed into a small room. Soon afterwards he said he felt sick, and asked for some water, which was brought to him, but he no sooner saw it than he threw himself on the floor in a state of the greatest agony; he rolled from one end of the room to the other, striking himself against anything that came in his way, without apparently being sensible of the blow. This paroxysm lasted about ten minutes; he then became quiet, sat on the ground with his back against the wall, and his hands applied to his ears. His wife, at this time being again pressed to say whether he had ever been bitten by a dog, admitted that about six months before he had been bitten in the leg at Ahmedabad by a strange dog which ran away, and nothing more was known of it. The wound healed in a few days. On examination, two small cicatrices were visible at the inner side of the left leg, about two inches below the knee. They were not swollen, nor was there any surrounding redness or tenderness of the skin. A pill of opium and ipecacuanha was given to him ; he took it between his fingers, opened his mouth as wide as possible, and thrust it into the pharynx. He afterwards remained in the same posture for about ten minutes, apparently in great suffering; suddenly, without any observable cause, he threw his hands down from his head, stared wildly round the room, and in an instant sprung into the middle of the floor. The violence of this paroxysm was extreme. Two men held him down and tried to keep his head upon a pillow. He drew them from one part of the room to the other. At one time he would make the most violent spring upwards; at another he would jump nearly across the room ; occasionally his hands were thrust violently into his mouth, as if to remove the tenacious viscid saliva which seemed to collect in his throat and hang about his lips. During the whole of the paroxysm one hand was frequently engaged in scratching the outer side of the wounded leg ; at length, apparently worn out, he gradually became quiet, and again seated himself on the floor with his back against the wall. A pill of opium and ipecacuanha was again given to him, and he remained for about three quarters of an hour without a return of the paroxysm. At half past 6 o'clock in the evening I paid him another visit ; a paroxysm was then present more violent than any that had preceded it. It was with the greatest difficulty that he could be held down upon a mattress ; expectoration of thick adherent saliva was almost constant ; his hands were incessantly thrust into his mouth, and there was frequent hawking. From this time the paroxysms became more frequent and more severe ; and he died in one more severe than the others at half past 9 o'clock. No post mortem examination was made.

Edward Delany, aged 7 years, an European boy, was brought to the Jamsetjee Jejeebhoy Hospital, at the latter end of November 1848, having been bitten by a dog. The wound was situated over the left superciliary ridge, and was of considerable size and depth, a portion of the integument having been entirely torn away. The boy's father was sent at the time to make inquiries about the state of the dog; and from the information received, there appeared good reason to believe the animal was not rabid. The wound was dressed, and in about three weeks it had cicatrized. On the 26th December (one month after receiving the bite) the boy was brought to the Hospital at 7 o'clock in the morning. His father stated that for two days he had seemed uncomfortable and out of health, but did not make any complaint. In the early part of the preceding night he went to sleep at the usual hour, but was restless, frequently starting up in a state of alarm. Towards the middle of the night he awoke and did not again sleep, except for very short periods. It was then noticed that he seemed pale, and that his face was changed in expression ; he looked frightened and anxious. His skin was sometimes cold and clammy, at others hot and dry, and these different states succeeded one another at very short intervals, and were of very short continuance. At times his alarm was very great, and he would not allow his father to leave him for a moment. It was noticed that a good deal of thickish saliva collected about his lips, and evidently gave him annoyance, for he frequently tried to remove it with his fingers. During the whole night he asked at intervals for water, which he drank, but he appeared to have pain and difficulty in swallowing. He was now and then troubled with a short cough, which seemed to distress him, and at these times his father says his chest appeared fixed, and he had difficulty in getting his breath. The following is the note of his state taken on admission :—" He is now lying in his sister's arms. His face is pale, thinner than when last seen (about a week ago), and at times haggard and anxious in expression ; every now and then, however, the expression is calm and placid, and he seems disposed to sleep, but the least movement disturbs him. The skin is cold and covered with moisture. When touched, he shrinks from the hand, and says it gives him pain, especially when it is laid on the forehead. He begs of his father not to allow anyone to touch his head. The least attempt to change his posture excites great alarm, and his face then becomes extremely anxious. The cold air does not appear to affect him; the windows are all open, but he does not complain of the draught. He frequently wipes his lips with a handkerchief, at times pushing a portion of it into his mouth, as if to clear his tongue of something adhering to it. The pulse is not frequent; tongue covered with a brownish fur; bowels confined. He has just asked for water, but says it must be warm, otherwise he cannot drink it. A small quantity is brought in a pewter vessel. He expresses no alarm at the sight, but seems anxious to get hold of it; when given to him, he seizes the vessel with both hands and fills his mouth with a sort of gulp, but afterwards swallows slowly and with difficulty; after each mouthful there is catching of the breath, exactly resembling that which occurs when a person slowly walks into cold water. After drinking the water, he says he is cold and wishes to be well wrapped up with clothes. No medicine was given at this time. In the course of the forenoon, there was some tension and tenderness of the abdomen, and his bowels had not been moved. A powder of calomel and jalap was given, which soon afterwards operated, when he seemed better, appeared to suffer less, took some tea and an orange, and talked a good deal, though not quite rationally. About the middle of the day he complained much of pain of the left ear, and lay with his arm under that side of the head, as if the pressure gave him relief; at times he was said to be apparently free from suffering, when suddenly, without any obvious cause, he would become alarmed or complain of chilliness, and desire to be covered with the bed clothes. The pulse continued moderate, and the skin cool, if anything rather under the natural heat. At the evening visit he was in much the same state: a draught of the tincture of morphia was taken. For a couple of hours after the draught he remained quiet, but did not sleep. At 10 o'clock he sprang out of bed and tried to run out of the room, after which he became extremely restless. He would not allow his clothes to remain upon him, even his socks irritated him. He fancied the room filled with spectres, and that he was covered with worms, which he was constantly endeavouring to remove with his fingers. The skin was raised above the natural heat, and the pulse more frequent but of less strength. At 12 o'clock the restlessness and suffering were very great, and evidently becoming more aggravated. At half past 12 the inhalation of chloroform was commenced; 15 drops were put upon a sponge and held under the nose. The contact of the moist sponge with the lips produced a violent convulsion, which lasted for several minutes, but after he recovered from this the chloroform was inhaled without difficulty. Two drachms were expended before he was under its influence, about 25 drops being at each time put upon the sponge; complete insensibility for a few minutes was produced. At 3 A. M. his state is thus stated;—

"Since the inhalation of the chloroform he has been much more quiet. He has at intervals short spasmodic catchings of the breath, but has not had a paroxysm of any violence. He is constantly talking, but not rationally. Has drunk water several times, and apparently without much difficulty; pulse has lost a good deal of its power and is more frequent; bowels have been two or three times moved within the last hour." This state of comparative ease continued until half-past 6 A. M., when he again became restless and excited. At half-past 7, when the chloroform was a second time used, the following note of his symptoms was taken:—

"Breathing hurried and catching; frequent, short, convulsive attacks, excited by anything coming into contact with his skin. He imagines insects are crawling about his skin, and that he has a rat inside his trowsers. He is greatly alarmed if any one approaches him, and scarcely remains for a moment in one position." He was now brought completely under the influence of the chloroform, and the effect more or less kept up for about 30 minutes. The muscles became ralaxed, and he lay for some time quite quiet. At 9 o'clock it is noted "since the chloroform was administered, he has been easy and quiet, until within the last quarter of an hour. Has eaten part of a plantain and some biscuits. He is now however much excited; screams if any one approaches him suddenly, but his father, by doing so slowly, can take his hand without causing him much uneasiness Has just had a very violent convulsion." The chloroform was again used, he was brought completely under its influence, and kept so for several minutes. The relief was marked, and he was quiet for a short time afterwards. At 12 o'clock, however, the convulsions were very frequent, and excited by the least movement. The viscid, tenacious saliva collected in large quantity, and occasioned the greatest distress. The pulse was frequent and feeble. Until 5 o'clock in the evening, the chloroform was inhaled every hour, with relief each time, but only for a few minutes, and the periods of relief became gradually shorter. At 5 o'clock he was evidently much worse; the paroxysms were almost constant, and he required to be held down. Pulse very feeble and rapid. At 7 o'clock he was seen by me for the last time. He died at 8 o'clock.

Notwithstanding that the mind is more or less disturbed in the paroxysm, during which the patient will sometimes bite and try to injure persons near him, yet in the intervals he is often quite calm. In some cases there are remissions, during which the patient can take food and drink. The duration of hydrophobia is from two to five days, but it is sometimes prolonged for seven or eight days.

Pathology.—Of the pathology of hydrophobia we are entirely ignorant. No morbid changes have ever been found with which the symptoms can in any way be connected.

Causes.—As already mentioned, hydrophobia has one cause only, viz. inoculation with a poison from an animal affected with a disease which is known as "rabies." The poison is no doubt contained in the saliva of the rabid animal, since hydrophobia is usually caused by a bite; but there is no proof that it may not exist in other secretions or in the blood. The animal, the bite of which for the most part causes rabies, is the dog: but other carnivorous animals, as the cat, jackal, wolf, fox, &c. have produced it. Whether herbivorous animals or birds can impart hydrophobia is uncertain, but it is probable that the saliva of any animal affected with rabies, not excluding man, may produce it when inoculated. There is doubt if the poison can be absorbed through the cuticle, but none that it may be received into the blood through a mucous membrane.

It would appear that *all* persons are not equally susceptible of the action of the poison, or that the quantity and quality of the poison may vary. It is computed that only 1 in 20 of those bitten by dogs suffer; the proportion is larger in bites from rabid wolves. No doubt immunity is sometimes due to the saliva being wiped off the teeth as they pass through the clothes of the person; and it is quite possible, that when a considerable number of persons have been bitten, the poison may have been exhausted before they were all wounded.

The origin of rabies in animals has been much discussed. It must at some time or other have arisen spontaneously, but at the present time it is believed to be always caused by inoculation. In certain countries, as Australia, and I believe also some parts of the West Indies, rabies is unknown. In India it is of common occurrence.

Symptoms of Rabies in the dog.—The following account, which is a brief summary of the symptoms given by the best authors, is taken from Dr. Wood's work on the Practice of Medicine:—"The animal at first has an altered, and as it were suspicious look; is restless and frequently changes his position; often licks diligently some part of his body, where, upon examination, a scar may usually be seen; exhibits a strange disposition to pick up and swallow small objects of any kind, such as bits of thread, straw, hair, excrement, &c. and occasionally vomits. As the complaint advances he becomes irritable, flies at strangers or at other dogs, and though he may obey the voice of his master, resists correction, and is enraged instead of being terrified by the sight of the whip. There is profuse secretion of saliva, which flows from the mouth, and occasions foam about the lips. This is followed by extreme thirst, and apparently the secretion of a viscid mucus in the fauces, which the animal seems desirous of getting rid of by working with his paws at both angles of the mouth. The breathing is laboured; a peculiar sound is made in inspiration; and the character of the voice is changed. The bark is said to be peculiar and characteristic, something between a bark and a howl. If at liberty, the animal is incessantly at motion, snaps at other animals when they meet him, and sometimes seems to seek occasion to attack them."

Diagnosis and prognosis.—There is no disease that resembles hydrophobia. It is said to be difficult to distinguish it from tetanus; but although not less than five hundred cases of tetanus have fallen under my observation, I have never seen one that bore any resemblance to hydrophobia. The prognosis is altogether unfavourable, it being doubtful if recovery has ever taken place.

Treatment.—When hydrophobia is fairly established, no treatment has been of real service, although almost every remedy in the pharmacopœia has been tried. Temporary relief is undoubtedly obtained from the inhalation of chloroform, and perhaps, also, though in less degree, from opiates and sedatives, but the fatal termination is not delayed.

As hydrophobia cannot be cured, attempts have been made to prevent its occurrence by excision of the bitten part; and by most persons great confidence is placed in this proceeding. In some instances the wounds are so numerous and extensive, that they cannot be completely excised, and in any case it is extremely difficult to ascertain the extent to which the saliva may have penetrated. Nor should it be forgotten, that we seldom have an opportunity of performing excision until many minutes, and sometimes many hours, have elapsed after the receipt of the wound.

It might be asked, what reason is there for supposing that the poison will remain unabsorbed, not for a minute or an hour, but for a second or the fraction of a second? If we inject under the cuticle a solution of any substance which can be easily recognised in the blood, it is discovered in that fluid almost as soon as it has been injected, and there does not appear to be the least reason to suppose that the saliva of a rabid animal, and the poison it contains, are less readily absorbed. I am not unaware that, in opposition to this kind of reasoning, the authority of experience will be adduced. I should be sorry, indeed, in a matter of practical importance, to under-estimate the value of experience; but as regards excision in hydrophobia, what is called experience amounts very much to this:—In a considerable number of instances, where persons have been bitten by rabid animals, the bitten part has been excised, and the patients have not had hydrophobia. In a considerable number of instances the part has been excised, and the patients *have* died of hydrophobia, and in a still larger number, where excision has not been had recourse to, a few have died whilst the greater number have escaped. What exact proportion these classes bear to one another has not, so far as I know, been ascertained, nor perhaps is it capable of being ascertained. When it is remembered, that of twenty persons bitten by a rabid animal nineteen will probably escape should no surgical treatment be adopted, it is clear that excision must be performed a great many times before the proportion will have been reached, which will entitle it to be considered as a preventive.

Whilst, therefore, should the wound be of small size, I would not dissuade any one from performing excision, I have not such confidence in its efficacy as would induce me to practise it when the wound is large and when there are several wounds.

CHAPTER II.

DISEASES OF THE SPINAL CORD.

The spinal cord and brain resemble one another in their anatomical arrangement, each consisting of a mass of nervous substance enclosed within membranes. There is also much that is common to both in regard to the diseases to which they are liable. But they differ in this—the spinal cord, besides being a nervous centre, and as such presiding over reflex movements and influencing the organic functions, is also the medium through which the brain is brought into relation with the various parts of the body. Hence, destructive changes in the cord are attended by phenomena that do not differ from those which depend upon cerebral disease. For example, loss of sensation and of voluntary motion are alike produced by lesion of the cord and of the brain. It results, therefore, that the symptoms of spinal disease are partly those which indicate derangement of the cord as a nervous centre, and partly those which result from diminution or loss of its conducting power.

The exact parts of the cord, along which the various impressions are transmitted, remain to be determined. The researches of Dr. Brown-Séquard point to the gray matter as the chief medium of transmission of sensory impressions; but notwithstanding the weight of his authority, and the proofs he has adduced, more facts are, in my judgment, required before his views upon this point should be considered to have been established. No white or conducting fibres can be traced throughout the gray matter. To admit Dr. Brown-Séquard's doctrine, is to admit that the gray or vesicular matter has the power of *conducting* as well as of *originating* nervous influence, and this does not seem very probable. That decussation of sensory fibres takes place in the gray matter of the spinal cord, and not in the brain, as was formerly supposed, has the strongest evidence, both physiological and pathological, in its favour: and indeed, is almost necessary to explain phenomena which are not unfrequently observed in disease of this part of the nervous centre.

Inflammation within the spinal canal may be limited to the membranes or nervous tissue, but more frequently involves both. It may, however, for a time at least be restricted to one, and for this reason, and for the sake of precision, it is desirable, as in inflammations of the encephalon, to treat separately of inflammation of the *membranes* and of the *cord*.

SPINAL MENINGITIS.—*Inflammation of the membranes of the Cord.*

ACUTE SPINAL MENINGITIS.—*Symptoms.*—Many of the symptoms of meningitis vary according to the part of the cord which is inflamed. One symptom however is always present, viz. pain, which is often severe and increased by movement, but not by pressure. When in the dorsal or lumbar region, it is accompanied by a feeling of constriction round the chest or abdomen. In some instances, there are pains resembling rheumatic or neuralgic in parts supplied by nerves from the affected portion of the cord. The attack in most instances commences with a sense of weight and fatigue in the limbs, but may set in suddenly with severe pain, and more or less febrile disturbance. As the disease becomes developed, there are spasms (tonic) of various muscles: the mouth may be closed (trismus), or trunk and head bent backwards (opisthotonos). Clonic spasms occasionally occur in paroxysms, which are often excited by movement or change of posture. Other symptoms vary according to the seat of the inflammation. When in the upper part, there may be dyspnœa, palpitation, &c. and when in the lower part, retention of urine and constipation of the bowels. The symptoms often remit, but almost always return with increased severity. If the inflammation should not be subdued, the cerebral function becomes deranged, as indicated by delirium, drowsiness, and coma. In the advanced stage there are involuntary discharges from the bladder and rectum, and the patient sinks, the duration of the attack being from about five to fifteen days.

CHRONIC MENINGITIS.—There is a chronic form of spinal meningitis, but which is more rare than the acute variety. The symptoms are pain in some part of the spinal region, or uneasy sensations in the extremities, followed by muscular rigidity. In some instances, there is palpitation, or pain and constriction of the abdomen. Paralysis afterwards occurs, and the patient gradually sinks from exhaustion.

Causes.—The causes of spinal meningitis are exposure to cold, injuries, as blows, sprains, &c. suppressed evacuations, rheumatic diathesis, &c. Chronic meningitis is often associated with disease of the vertebræ.

Pathology.—After death from acute meningitis, the products of inflammation are usually found, viz. lymph, serum, and pus; and very generally the cord is softened. In chronic cases the membranes are thickened, indurated, and adherent.

Diagnosis and prognosis.—Spinal meningitis may be distinguished from rheumatism by the muscular spasms, the feeling of constriction round the chest and abdomen, and the febrile disturbance. The diagnosis between it and myelitis will be explained under the latter disease. The prognosis is for the most part unfavourable, although recovery does occasionally take place.

CEREBRO-SPINAL MENINGITIS.—Both the cerebral and spinal meninges may be affected at the same time, and this may happen from the ordinary exciting causes of inflammation; but cerebro-spinal meningitis has prevailed as an epidemic amongst persons who were badly fed and living in overcrowded prisons or barracks. There is ground for the belief, that this apparently epidemic form was a complication of typhous fever.

MYELITIS.—*Inflammation of the substance of the cord.*

ACUTE MYELITIS.—*Symptoms.*—The symptoms which are more or less common to myelitis, in whatever region of the cord it may be situated, are pain *increased* by pressure, formication, tingling, or anæsthesia, and subsequently paralysis in those parts which are supplied by nerves from the diseased portion of the cord; but there are other symptoms which vary according as the inflammation is in the upper or lower part of the cord. When in the *cervical* and *upper dorsal* region deglutition is difficult, the head cannot be supported, and the breathing is diaphragmatic. There is palpitation of the heart, and paralysis of the upper and lower extremities, or of the former alone. When, as it is most common, in the *lower dorsal* and lumbar region, the lower extremities are chiefly affected, the bladder is paralysed, and there is a feeling as if a cord were tied round the lower part of the abdomen.

Acute myelitis mostly commences with perverted sensations and coldness of the fingers and toes, which gradually extend towards the trunk; but when the attack is severe, it may be set in with convulsions. Its duration is seldom more than from ten to twelve days, and it has been fatal in a much shorter period.

When myelitis is *chronic*, the symptoms are the same as in the *acute* form, only that they come on much more slowly. At first weakness, numbness, and perverted sensations, as formication, pricking, tingling, &c. are felt in the fingers or toes, and these may be preceded by hyperæsthesia. Afterwards there is pain, generally in the back or loins; control over the muscles of the limbs is partially lost, and the gait becomes uncertain and tottering. At length there is complete paralysis, sometimes both of motion and sensation. Symptoms of derangement of abdominal or thoracic organs depend upon the extent to which the cord is affected. In most cases there is retention of urine with colicky pains and constipation of the bowels, and occasionally irregularity of the functions of the heart and lungs. The further effects of chronic myelitis will be considered under "paraplegia."

Causes.—Myelitis is more common in males than females. It has been attributed to cold, injury, excessive labour, disease of the vertebral bones, excessive venereal indulgences, &c. In many cases no cause can be traced.

Pathology.—The cord is usually found after death in a state of softening, which may either be *red* or *white*. The whole thickness of the cord may be softened, or a portion only of it, and the softened portion may be mixed up with the products of inflammation.

Diagnosis.—Myelitis may be distinguished from spinal meningitis by the perverted sensations, formication, &c; by the pain being increased by pressure and not by movement; by the absence of muscular spasm, and by the early occurrence of paralysis. It must however be remembered, that inflammation usually, and perhaps always in the advanced stages, involves alike the membranes and the substance of the cord.

Prognosis.—The prognosis in acute myelitis is unfavourable. Recovery from the chronic form is not however uncommon.

Treatment.—The treatment of spinal meningitis and myelitis is the same as that for cerebral meningitis and cerebritis, to which the student is referred.

Hæmorrhage.—Hæmorrhage within the spinal column is produced much in the same way as hæmorrhage within the cranium, but it is much less common. The blood may be effused between the bone and the theca, between the membranes, or into the substance of the cord. The sudden occurrence of paralysis without head symptoms, would lead to the suspicion that hæmorrhage had occurred. The patient should be kept perfectly at rest, and cold applied to the spine; the diet should be reduced, and inflammation watched for and met by the usual remedies.

Hydro-rachis.—Fluid (serous) sometimes collects within the spinal canal, and is not unfrequently a portion of a larger quantity, which is contained within the cranium—as in hydrocephalus. In many instances hydro-rachis is congenital, and there is usually arrest of development of the bones of the vertebral column. A fluctuating swelling appears, which can often be lessened by pressure. The disease is then called "spina bifida"; for the effects and treatment of which the student is referred to works of Surgery.

Within the last few years, attempts have been made to connect certain symptoms with disease of particular parts of the cord.

When the posterior columns are diseased, there is difficulty in directing the movement of the limbs, so that the patient is often unable to walk, although, when lying in bed, he can move the limbs freely. Sensibility is increased—as regards touch or mechanical irritation, changes of temperature, and galvanism—in all those parts which have nervous connection with the posterior columns, and in the same parts reflex action is lost or diminished. When along with the posterior columns the posterior roots of the nerves are implicated, in place of hyperæsthesia there is loss of sensation (anæsthesia). Walking or standing is almost impossible, notwithstanding that power of moving the limbs is retained when the patient is in the recumbent posture. Reflex action is completely lost in all the anæsthetic parts.

When the alteration extends from the posterior columns to the gray matter, there is nearly, if not complete, loss of sensibility, and if to the anterior columns of the gray matter, voluntary movement is quite lost.

Disease in the gray matter alone does not differ in its effects from that just described, except that at first there is more anæsthesia than paralysis.

When the anterior columns are diseased, except in the immediate neighbourhood of the medulla oblongata, there is more or less complete paralysis of voluntary movement, with diminished reflex movement, and slight hyperæsthesia in all the parts below the seat of disease.

Alteration of the lateral columns in any part of their length, except near the medulla oblongata, causes imperfect paralysis of movement, hyperæsthesia, and slight diminution of reflex action.

Disease of the anterior columns, close to the medulla oblongata, does not cause paralysis or anæsthesia. Slight hyperæsthesia and pain are felt in various parts of the body.

TETANUS.—*Tonic spasm of the muscles, with paroxysms of clonic spasms, the intellectual functions being undisturbed.*

Tetanus occasionally occurs in all countries, but is much more common in tropical than in temperate climates. During the last fifteen years 554 cases of this disease have been treated in the Jamsetjee Jejeebhoy Hospital at Bombay, a considerable proportion of which have been under my care or observation. In the following descripton I shall for the most part confine myself to the results of my own experience.

Two forms of tetanus may be recognised, viz. *traumatic* and *idiopathic;* the one being obviously due to some local source of irritation, whilst the other is to appearance independent of it. Either of these forms may be *acute* or *chronic,* the distinction being mainly founded upon a difference in the severity of the symptoms and the rapidity of their progress. In regard to the danger and comparative frequency of the two forms, there is little difference in tropical countries, but in temperate climates the idiopathic form appears to be less frequent and less severe than the traumatic.

Symptoms.—The manner in which tetanus begins is not always the same. There may be febrile symptoms, but this is rather the exception than the rule. Some persons are attacked suddenly after sleeping out of doors or exposed to a cold wind; others at a variable period after the receipt of a wound or injury, whilst in some the attack comes on slowly and insidiously without any cause being traceable. The first symptom is in most cases pain or stiffness of the muscles of the neck, jaw, or throat, which might be mistaken for the effect of cold, only that much more is made of it by the patient, than would be made of mere rheumatic pain or stiffness. Besides pain, there are sometimes spasms of the muscles of the throat, when the patient attempts to swallow, and by which deglutition is rendered slightly difficult. At this time, or even before, the face is altered: it appears broader—the angles of the mouth being drawn outwards—the lips are compressed, and eyelids slightly corrugated. This change may exist for several hours before there is any other symptom of tetanus. The abdominal muscles next become rigid, and paroxysms of spasms set in, which at first recur at long intervals, and are for the most part limited to the muscles of the back, causing that distortion of the body called "opisthotonos." Soon, however, they extend to other muscles, and become more frequent, being excited by the slightest irritation—as a person walking across the room, &c. until nearly all the muscles are affected, and there is scarcely any interval between the paroxysms. Each paroxysm is accompanied by violent pain, shooting from the epigastrium to the spine, and which is thought to be due to spasm of the diaphragm. The appearance of the face is now highly characteristic: the furrows are much exaggerated, the skin of the forehead is thrown into transverse and perpendicular folds, the angles of the mouth are drawn downwards and outwards, and the lips compressed. There is difficulty in opening the mouth, or the jaw may be quite closed. The pulse is not at first accelerated, except during the paroxysms; but as the disease makes progress, it becomes frequent, also in the intervals. The breathing may be unaffected, but in bad cases is hurried and oppressed. The digestive and nutritive functions appear to suffer but little: the tongue is seldom much furred, and the appetite is in general good; the bowels are constipated, but this is probably due to rigidity of the sphincter muscle. Sometimes the rigidity or even the clonic spasm of the muscles is for a time limited to certain sets of muscles—as to the muscles of the jaw (trismus), or to those of a wounded or injured extremity. In most cases the spasms are most powerful in the muscles of the back, causing ophisthotonos; but in rare cases, those of the front or side of the body are predominant, producing emprosthotonos or pleurosthotonos.

Progress.—The progress may be *rapid* or *slow*. When *rapid*, the patient dies from syncope, or is asphyxiated in a paroxysm of spasms within a few days or even a few hours from the commencement of the attack, the pulse and respiration having been previously but little affected. More frequently however, as the paroxysms of spasms become more severe, the pulse increases in frequency and loses in strength; the breathing is hurried, and the skin becomes covered with a cold clammy moisture. The face has a pinched and anxious expression, the power of swallowing is lost, and the patient sinks from exhaustion, in a period varying from three to six or seven days. When *slow*, life may be prolonged for many days or several weeks, and the patient then dies worn out by suffering; or the paroxysms gradually becoming less frequent and severe, there is slow recovery. A few additional remarks may be made upon some of the more important symptoms.

Muscular system.—The earliest indication of the disease in the muscular system is seen in the muscles of the face, giving rise to the peculiar expression which has been already noticed; the muscles of the neck and of mastication are very soon afterwards attacked, and then those of the abdomen. The tonic spasm, I believe, in general precedes the other variety of muscular contraction, and in the abdominal muscles, the muscles of the jaw, and in those of the neck, continues throughout the whole course of the seizure. The severity of the clonic spasms, that is the violence of the paroxysms of spasms, is not always an indication of the danger to be apprehended—much more depends upon the number and class of muscles affected. In some cases the paroxysms, though short and not severe, are yet general, scarcely any of the voluntary muscles, if we except those of the feet and hands, being free. To a casual observer, the severity of such cases is not apparent. There is not at first sight evidence of that dreadful suffering which is present in other cases; yet this, according to my experience, is one of the most dangerous forms of tetanus, few persons thus attacked surviving the third day. In another class of cases, particular sets of muscles are implicated, and to those the spasms are in a measure confined. The muscles concerned in the function of respiration are sometimes the seat of the spasms, whilst there may be few elsewhere.

With the exception of hurried breathing, there are in these cases few external signs of their severity, yet the fatal termination is seldom prolonged for more than a day or two. Opisthotonos, though to appearance alarming, is not always a measure of the danger of the attack; indeed, it is in some degree rather favourable than otherwise, as it shows that all the muscles at least are not contracting with equal violence.

In some cases the muscles of deglutition are affected from the beginning; and this is very serious, as it prevents the administration of nourishment, which in this disease is so much needed.

Closure of the jaw.—Closure of the jaw (trismus) is seldom altogether absent, but the degree of closure bears no kind of relation to the severity of the attack. In some of the worst cases, the mouth may be opened sufficiently wide to admit of the introduction of one or more fingers, whilst in comparatively mild cases it is not unfrequently almost closed.

Circulation and respiration.—The state of the pulse has long been known to indicate the severity of the disease. When it becomes frequent, small, and easily compressible, the danger is great; at the same time death may occur from asphyxia in the early stage, whilst the pulse is little accelerated. Quick and oppressed breathing is at all times a very serious symptom: sometimes this occurs within the first few hours; at others several days elapse before it is observed.

Intellectual functions.—The intellect is in general clear to the last, and in the few instances where it is not so, the disturbance is due to the narcotic remedies which are usually employed.

Causes.—The most frequent cause of tetanus is a wound or injury; but in a considerable proportion of cases no local irritation can be discovered. It is quite possible however, that in some at least of such cases, there may be internal sources of irritation which escape observation. Many attacks are attributed to exposure to cold. That there are predisposing causes of tetanus, which have not been detected, is certain. How far an uniform high temperature is one of these is not determined; but the fact of the greater prevalence of the disease in hot than in cold countries, gives weight to the belief that it may be in some way or other operative.

Infants, in tropical climates and elsewhere, when they are ill cared for, are sometimes affected with tetanus, which usually comes on within the first, and seldom or ever later than the second week after birth. It is attributed to irritation caused by the separation of the umbilical cord; and such may without doubt be its exciting cause, when a predisposition exists. Tetanus in infants is nearly always fatal; but it is believed that it may generally be prevented by proper sanitary arrangements, and by care in managing the separation of the cord.

Pathology.—No light has been thrown upon the pathology of tetanus by the changes which have been noticed after death. Beyond turgescence of the cord, and slight serous effusion, little has been observed. There is every reason to believe that inflammation plays no part in the morbid process, whatever that may be. That one of the actions of the spinal cord, viz. that which relates to the production of motor impulses, is in excess, there is no doubt; but whether the excessive production is due to an exaltation of the function of the vesicular part of the nervous substance, or whether there is merely a respondence to impressions which are brought to it, is not known. In *traumatic* tetanus, where there is an obvious source of local irritation, from which it may be supposed abnormal impressions are incessantly being conveyed to the nervous centres, the latter view would at first sight seem to be correct. But the occurrence of tetanus, in only a very limited number of instances, even after severe wounds, renders it evident that there must be some peculiarity in the condition of the nervous centre, whereby it is rendered unusually susceptible of the impressions brought to it. On the other hand, in *idiopathic* tetanus, where there is to appearance no local irritation, it might be thought that the sole morbid change was in the nervous centre. But as before mentioned, there may be sources of irritation which cannot be discovered, or the blood may be altered, or may contain some abnormal matter—*a materies morbi*—capable of acting upon the polarity of the cord. Further speculation would be out of place in this work.* The termination of tetanus in death by apnœa, is no doubt due to spasm of the respiratory muscles. Syncope, which is also a frequent mode of death, is sometimes caused by spasm, but more commonly by paralysis of the muscular fibres of the heart.

Prognosis.—The prognosis in tetanus is unfavourable, two out of every three persons attacked with it die. It has been said, that acute cases always terminate unfavourably, whilst chronic cases often recover. The statement, I believe, merely amounts to this: that if the symptoms are not very severe from the commencement, or if severe, gradually become mild in character, there is a fair probability of recovery. Whether the attack is to be *severe* or *mild* cannot by any means always be known at first. What appear to be very severe cases, after a time assume a different character, whilst, on the other hand, attacks which at first have been slow in their progress and without severe symptoms, are suddenly changed into the most severe and dangerous form. *Idiopathic* is said to be less dangerous than *traumatic* tetanus; but this does not accord with experience of the disease in Bombay. The most favourable cases are those in which the pulse is but little affected, the paroxysms unfrequent, the breathing undisturbed, and the strength but little impaired.

A frequent and small pulse, hurried breathing and dysphagia, or any *one* of these symptoms, when in a marked degree, indicate a fatal termination.

Treatment.—The treatment of tetanus should be conducted upon the following principle, viz. to keep up the action of the heart, and support the patient's strength, until such time as the disease may subside of its own accord. This may appear to contract the utility of remedies within a narrow limit, but this is more in appearance than in reality; in any case, it may be safely affirmed, that every attempt to cut short the attack, has resulted in failure or aggravation of the disease. To keep up the patient's strength, nutritious food must be administered, pain relieved, and sleep if possible procured. Farinaceous food, milk, eggs, broths, &c. must be given in small quantities at short intervals, and as the action of the heart becomes enfeebled, wine or brandy should be added. Pain is to be relieved by diminishing if possible the severity of the spasms, and by the use of opiates. The patient should be placed in a darkened and quiet room ; no more persons than are requisite to attend upon him should be allowed to enter it, and the attendants should be warned not to touch the patient. Currents of air should be excluded. As it is impossible to say that the spasms may not be aggravated by an overloaded state of the intestinal canal, an active purgative, as croton oil, colocynth and calomel, may be given in the early stage of the disease, but this should not be often repeated. Everything having been done that can be done to lessen the severity of the spasms, without at the same time depressing the action of the heart, opium or other narcotic medicines are to be given in moderate doses, and repeated at intervals of three or four hours ; and the effect of the opiate may sometimes be aided by the inhalation of a small quantity of chloroform. The free use of narcotic medicines, and the free inhalation of anæsthetics, hastens the fatal termination of the disease. Dr. Morehead states the injurious effects of narcotics in the following words :—" That as recovery is always gradual and slow, it cannot be a safe system of treatment to use remedies which, while they make a decided impression on the tetanic symptoms, tend to derange and materially injure other actions important to life. Such remedies are narcotics, given to the degree of frequently inducing or maintaining a state of marked narcotism. With this view opium, extract of hemp, belladonna, inhalation of ether and chloroform have been used. The tendency of this treatment is, while it relieves the spasm, to cause death by coma. Nay, more, associated with narcotics, there is always a failing action of the heart ; therefore, under narcotics used to this degree, the tendency to death by syncope, already distinct in tetanus, becomes seriously increased. Further, if in cases thus treated, the narcotics be intermitted, it will be found that the spasms will recur with greater frequency and severity than before the exhibition of those remedies had commenced."

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* For some very good remarks upon the pathology of tetanus, reference is made to Dr. Morehead's Clinical Researches, page 673. The student may also consult a paper by the author in the Transactions of the Bombay Medical and Physical Society, No. 1, New Series.

From thirty to forty minims of the tincture of the muriate of morphia, or the same quantity of the tincture of hemp, may be administered every four or six hours; and the dose may, as the system becomes habituated to the narcotic effect of the medicine, be increased to fifty minims, but should not be carried beyond this. It is quite immaterial what narcotic is used—none has any special influence over the disease.

Small quantities of chloroform may be inhaled at intervals of three or four hours; and in chronic cases, where there is much difficulty in opening the mouth, the inhalation may be prescribed a short time before each meal is taken.

PARALYSIS; PALSY.—*Loss of mobility and sometimes of sensation in a part of the body or extremities.*—Paralysis is not strictly speaking a disease, but is rather the symptom of a disease, being the result of impairment of the function of the nerve vesicles or of the conducting property of the nerve fibrils. The function of the *nerve vesicles* may be impaired or destroyed by inflammation, or by defect in the blood supply, whereby nutrition is inefficiently carried on, or not at all. The conducting power of the *nerve fibrils* is diminished, suspended, or lost, when a nerve is mechanically injured or pressed upon, or its nutrition impaired. Certain poisons, as opium, chloroform, and lead, being brought into contact with nerve fibre, impair or destroy its conducting power. Excretions retained in the blood, as the constituents of urine or bile, &c. are capable of suspending or destroying the function of both the vesicular and tubular structures. Moreover, it is also well established, that paralysis both of motion and sensation may be caused by reflex action: for example, irritation at the peripheral extremities of a nerve has been followed by paralysis of muscles supplied by another nerve. Irritation of the genital organs, as a cause of paraplegia, or of the stomach or intestines, of various local palsies, may be mentioned in illustration. The "*modus operandi*" of such irritation is believed to be by acting through the nerves which are distributed to the blood vessels of the spinal cord or brain, whereby nutrition of those organs is interfered with.

A part that is paralysed is generally pale or livid and shrunken. Its temperature may either be raised or lessened. The circulation is mostly feeble. The muscles are either quite flaccid or rigid, and after a time there is gradual wasting of the paralysed part. Paralysis is either complete or incomplete; that is, there may be an entire loss of movement, or the patient may retain slight or considerable power over the affected part. It may also be *general* or *partial*, according as all or nearly all of the muscles or some only of them are affected.

PARTIAL PARALYSIS.—Under this heading will be classed *hemiplegia*, *paraplegia*, *local palsy*, and *palsy* due to specific causes.

HEMIPLEGIA.—By hemiplegia is understood more or less complete loss of voluntary power over the muscles of the upper and lower extremities of one side. Some of the facial and lingual muscles, the muscles of mastication, and occasionally the intercostal muscles are also affected. Sensation in the paralysed part may be lost, but is more frequently unimpaired.

Symptoms.—An attack of hemiplegia may come on suddenly, as explained under apoplexy, or it may be gradual in its approach, there being at first slight loss of movement, which progressively becomes more marked. In rare instances it begins in the extremities and gradually creeps upwards, being preceded by perverted sensations, as formications, tingling, &c. In a well marked case, the upper and lower extremities are altogether removed from the control of the patient's will, although reflex action may often be excited. If the arm is raised, and then allowed to drop, it will fall as if without life, the muscles being quite flaccid, or, at the most, there is rigidity only of the biceps muscles. The face is distorted; the cheek and angle of the mouth on the affected side droop, and the opposite angle is drawn upwards and to the sound side. From paralysis of the buccinator muscle, food slips between the jaw and the cheek, and requires to be removed by the fingers; and from the same cause, when the patient tries to blow, the cheek on the affected side is much more expanded than on the opposite side. Few of the muscles of the face are affected, and both eyes can be completely closed. When the tongue is protruded, it nearly always deviates to the affected side; that is, to the side opposite to that to which the mouth is drawn. This is explained by the muscles on the sound side of the tongue drawing that side forwards, and thus causing the tip to deviate to the opposite side. Articulation is impaired, and sometimes speech is quite lost. The nerves implicated are the 5th and 9th pairs, and perhaps also the portio dura. In some instances the upper eyelid droops (*ptosis*) and there is squinting—the 3rd pair is then affected. The intellectual faculties are nearly always impaired, and in some instances there is delirium or coma. The general symptoms have reference to the state of the nervous system upon which the paralysis depends: the skin may be above or below, or of the natural temperature; the pulse full and firm, or what is more frequent, small and easily compressible; the bowels are generally constipated, and the urine scanty.

Progress.—The patient may become drowsy and comatose, and die in a few hours, or within two or three days; or sink from exhaustion many days or weeks after the seizure. In a large proportion of cases there is gradual recovery, which may be complete or incomplete; that is, the patient may entirely regain the use of his limbs, as if nothing had happened to him, or, as is more common, recovery goes on up to a certain point and then ceases, more or less lameness being left. There are certain symptoms which appear to throw light upon the nature and situation of the lesion which has caused the paralysis: when the muscles are from the first rigid, there is more or less irritation in the nervous centre—as inflammation, a clot of blood, &c.; when the muscles are *quite* flaccid, white softening may usually be diagnosed. If at the time of the attack there is complete insensibility, considerable effusion of blood, which presses upon the hemispheres, may be apprehended.

Pathology.—Hemiplegia may be peripheral, dependent upon disease of the cervical portion of the spinal cord, or connected with hysteria, chorea, &c; but in by far the greater number of instances the lesion is in the encephalon. When above the decussation of the pyramids, it is always upon the side opposite to that which is paralysed, and is for the most part situated in the *corpus striatum* and *thalamus opticus.* Those parts are often found in a state of softening—*red* or *white* (page 404). In some instances there may be no appreciable morbid change, in which case the paralysis is probably reflex, or due to a poison in the blood. Reflex paralysis has only of late been fully understood. It appears that under certain circumstances, when irritation is applied to the peripheral extremity of a nerve, an impression is transmitted to the spinal cord or brain, and by a reflex action in the cord itself, transferred to the *vaso-motor nerves*. Passing along these nerves to the coats of the vessels which are distributed to the nervous substance, it causes contraction, and thus diminishes the quantity of blood which circulates through them, whereby the nerve-matter is imperfectly nourished, and its vital endowment lowered or suspended.

The more tangible conditions of the brain, to which hemiplegia may be related, are *pressure* or *softening*. Pressure is sometimes caused by simple congestion, but more frequently by a tumor or clot of blood. Softening is produced in various ways: it is a common result of inflammation, but perhaps still more frequently of hæmorrhage, and obstruction to the circulation.

Paralysis of motion in hemiplegia is generally greater than that of sensation; but when the lesion is deep and extensive, sensation is often quite lost.

In hemiplegia from spinal disease or injury affecting one half of the cord, the loss of sensation is on the side opposite to that on which there is paralysis of motion; this is explained by decussation of the sensory filaments in the gray matter. The loss of muscular power is of course mainly due to want of nervous influence; but after paralysis has existed for some time, the muscles do not always at once recover their contractility, even when nervous force is restored. This is probably due to atrophy of the muscular fibre from inaction.

The occasional association of hemiplegia with epilepsy, chorea, and hysteria, should not be overlooked. In such cases it is usually transient.

Treatment.—In all cases of hemiplegia, the patient should be kept perfectly quiet in the horizontal posture, and all causes of excitement rigidly excluded. The head should be slightly raised, and the bowels evacuated by an enema. The further treatment must depend upon the condition of the brain or spinal cord. If there is inflammation or determination of blood, it might be necessary to have recourse to blood-letting, general or local; or this measure might sometimes be adopted to suppress or prevent hæmorrhage; but it should never be employed if the skin is cold and the pulse feeble, or if the patient is advanced in years, or there should be evidence of extensive arterial disease. If from headache, heat of skin, frequent pulse, &c. there can be little doubt that inflammation is present, mercury should be given until the mouth becomes slightly tender. If inflammation is chronic, the repeated application of blisters or other counter-irritants is often useful. In by far the greater number of cases, bleeding and mercury are either unnecessary or hurtful, since nutrition of some part of the nervous centre has been interfered with by a plug in one of the cerebral vessels, or by disease of the arterial coats, and depletion consequently cannot be of any service unless the heart's action should be unduly excited. The patient's diet must be restricted to what is nutritious, without being bulky or stimulating; the bowels should be kept free, so that straining at stool may be avoided, and symptoms of inflammation or of excitement of the circulation are to be carefully watched for and met by cautious depletion. Should none such set in at the end of seven or eight days, nervine tonics, as the sulphate and oxide of zinc, may be given.

When there is reason to believe that the lesion has been repaired, and that the paralysis remains because the contractility of the muscles has been impaired by inaction, remedies should be used which are calculated to excite muscular contraction. Frictions to the paralysed limb, strychnia, or even galvanism may be employed. We must be careful not to have recourse to such remedies too soon, and it is seldom that they are indicated within two or three months after the commencement of the seizure.

PARAPLEGIA.—*Paralysis of the lower extremities, and sometimes also of the lower part of the trunk.*

Symptoms.—Paraplegia usually begins with formication and other perverted sensations in the toes and feet; numbness follows, and gradually extends upwards towards the trunk, being limited above by a feeling of constriction, as if a cord had been drawn tightly round the body. At first there is merely want of control over the limbs, and consequent difficulty in walking, but afterwards the muscles are completely paralysed, and the patient is confined to bed. The palsy often affects the bladder and rectum, causing at first retention, and afterwards incontinence of urine and constipation of the bowels. The urine is turbid and ammoniacal from the decomposition of urea, and this is brought about by its retention in the bladder, and the action upon it of the mucous secretion. At length bed-sores form over the sacrum or trochanters, and the patient gradually sinks from exhaustion. Although voluntary movement may be entirely lost, reflex movements continue : twitchings or even spasms are not unfrequently present.

Two varieties of paraplegia are now generally recognised, viz. that which is due to *excess*, and that which is due to *deficiency* of blood in the vessels of the cord. Under the first are included determination, congestion, and inflammation. Under the second white softening and defective nutrition from reflex action. Excess of blood may be suspected when there are symptoms of irritation or exaltation of the functions of the cord, as twitchings, spasms, or convulsions, &c. or when there is pain in the spinal region and fever. A deficiency of blood is indicated by simple loss of function, *i. e.* loss of motion, or of sensation, or of both.

Reflex paraplegia is caused by local sources of irritation, of which disease of the urinary organs is the most common. The impressions transmitted by afferent fibres may be transferred to the efferent fibres which are distributed to the vessels of the cord, to those of the nerves, or to those distributed to muscles. In any case, the vessels are contracted, and hence, from deficient blood supply, nutrition of the parts supplied by them is diminished, and their function impaired. Reflex paraplegia may, according to Dr. Brown-Sequàrd, be distinguished from that due to myelitis by the following characters :—It is incomplete and limited to the lower extremities; does not extend gradually from below upwards, and affects in a slight degree only the bladder and rectum. Reflex power is neither lost nor increased. There is very rarely pain in any part of the spine, and no feeling of constriction round the abdomen or chest. Sensation is either slightly or not at all impaired, and formication, pricking, tingling, and other perverted sensations are wanting. Paraplegia, due to white softening, the pressure of tumours, or of effused blood, hysteria, &c. cannot be so readily distinguished from reflex paraplegia. The detection of some obvious source of local irritation will, in cases of doubt, materially aid in the diagnosis.

Pathology and causes.—The morbid appearances in paraplegia are very similar to those in the brain in fatal cases of hemiplegia. Paraplegia may be due to congestion, inflammation, or hæmorrhage, or to the pressure of tumours, either developed within the spinal canal, or reaching it by pressing upon the vertebræ, and causing their absorption. Disease and injury of the vertebræ not unfrequently produce it. It is often the result of the vessels of the cord being blocked up by clots of blood, or of the circulation through them being impeded by disease of their coats. The local sources of excitation in reflex paraplegia are very various; as before mentioned, disease of the urinary and genital organs is the most common, but irritation of the skin, or of a mucous membrane, or of a nerve in any part of its course, may be sufficient to cause it.

Of the more remote or exciting causes may be mentioned, injury of the spinal column, exposure to cold, venereal excesses, and probably the use of unsound grain.*

Treatment.—The treatment of paraplegia varies according to the state of the circulation in the cord: when there is excess of blood, as in myelitis, local blood-letting and counter-irritation may be had recourse to, and remedies given which cause contraction of the vessels of the cord, as ergot of rye and belladonna. When, on the other hand, there is deficiency of blood, as in white softening and reflex paralysis, the indication is to increase the flow, and cause dilatation of the vessels: the diet should be nutritious; but chief reliance must be placed upon strychnia.

In all cases when inflammation is absent, tonics should be given, and the nutrition of the muscles maintained by friction, &c. In reflex paralysis, it need scarcely be said, that the local irritation must if possible be removed.

Facial palsy.—Paralysis is sometimes limited to the muscles on one side of the face. The muscles on the sound side not being restrained by the antagonistic or tonic contraction of the muscles on the opposite side, draw and distort the features, causing great deformity. On the paralysed side all expression is lost, the natural furrows are effaced, and the eye cannot be closed. The movements necessary in frowning, laughing, &c. cannot be performed.

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* Indian Annals, No. 12.

Food taken into the mouth has often to be directed by the finger, otherwise it slips between the jaw and the cheek. When the patient tries to blow, the cheek on the affected side is puffed out, and the act of whistling cannot be accomplished, the air escaping at the corner of the mouth. The eye being uncovered is apt to become inflamed, and vision may be injured or lost. Sensation may be paralysed as well as motion, or paralysis of either may exist separately. Facial palsy is not in general connected with disease of the nervous centre, and is consequently not dangerous, though it is sometimes difficult or impossible to cure it. The portio dura is in many instances alone affected; but when sensation is impaired, the fifth pair is implicated.

Causes.—Facial palsy may be reflex, or caused by something which destroys the conducting power of the nerve. The most common cause of reflex facial palsy is exposure to cold; but other sources of irritation, as a decayed tooth, &c. have been known to occasion it. The conducting property of the portio dura may be destroyed by injury, or by pressure—as in mumps, the formation of tumours, &c. But the most common cause of pressure appears to be exudations from inflammation of the membrane lining the bony canal, in which the nerve is situated. In such cases pain in the ear is complained of. Although many instances of facial palsy can be related to some obvious cause, there are others which cannot.

As before mentioned, palsy limited to the portio dura does not usually depend upon disease within the head, but every now and then there are exceptions to this.

Treatment.—When facial palsy appears to be connected with inflammation, a few leeches should be applied behind the ear, and afterwards a blister; and mercury may be given, so as to cause slight tenderness of the gums, should there be nothing to contra-indicate its use in the general condition of the patient. Galvanism should be afterwards tried. If there is no reason to suppose that inflammation is present, some local source of irritation should be sought for.

PARALYSIS FROM LEAD, ARSENIC, &c.—Certain poisons in the blood occasionally cause local palsy; of these, lead is the most common. The disease occurs for the most part in painters, and the muscles first affected are the extensor muscles of the hand.

The wrists become weak, and the hand drops or hangs loosely down. Afterwards the muscles of the forearm and arm, and even other muscles are affected. The paralysed muscles waste and become atrophied. In most cases a blue line may be seen on the gums close to the neck of each tooth. Should the disease continue, epileptiform seizures take place, and the patient may die; but most cases recover, though slowly. The muscles chiefly affected are the extensor muscles, and it is probably that the poison acts both upon the muscular fibre and its nerves. In fatal cases, the brain has been found "pale and soft; its convolutions wasted; the sulci between them wide, and sometimes patches of white softening are seen in the hemispheres."

Treatment.—The chief objects in the treatment are to eliminate the poison and to restore the contractility of the muscles. The secretions generally should be actively kept up. Warm baths may be used, and benefit has been obtained from sulphur baths, made by dissolving from two to four ounces of sulphuret of potassium in from twenty to thirty gallons of water. The iodide of potassium is often given with advantage, and especially in combination with iron. In protracted cases, galvanism and strychnia are very serviceable.

Paralysis from arsenic is occasionally observed. Dr. Morehead describes a case in which both the upper and lower extremities were affected.*

PARALYSIS FROM PRESSURE.—Pressure on a nerve, as from the too tight application of a bandage, or sleeping with the arm hanging over the back of a chair, &c. has often caused paralysis. If the pressure has been slight, recovery may be anticipated, but if considerable, and of long continuance, although sensation may return, the paralysis of motion is permanent. The only remedy that holds out any prospect of benefit is galvanism.

PARALYSIS AGITANS.—Old people, and especially such as are of intemperate habits, are subject to a form of paralysis which is called "paralysis agitans," or shaking palsy. It is characterized by tremulousness or shaking, which begins in the head and upper extremities, and afterwards extends to the whole body, continuing even during sleep, and accompanied by muscular debility; and as this increases, the patient is unable to walk. At later periods, articulation and deglutition are impaired, and he gradually becomes comatose.

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* Clinical Researches.

Tonics and a nutritious diet should be administered, and galvanism tried. A form of paralysis similar to the above is sometimes caused by mercury. Warm baths and the iodide of potassium are the best remedies.

WASTING PALSY.—This is comparatively a rare affection, and its pathology but imperfectly understood. It commences by wasting of the muscles, generally in one of the extremities, which slowly extends to the greater number of the muscles of the body. There is no paralysis before the atrophy has made some progress, and sensation and intelligence are unimpaired throughout the course of the disease. In the advanced stages, the atrophy reaches the muscles of deglutition and respiration, and the patient is often carried off by a slight attack of bronchitis, being unable, on account of the condition of the respiratory muscles, to expel the secretion from the bronchial tubes.

As regards the pathology of this affection, it is as yet undetermined whether the muscles are alone affected, or whether the lesion is in the nervous centres.

Treatment.—The only remedy that seems to have been of service, is galvanism cautiously used.

NEURALGIA.—*Pain, usually paroxysmal, and unconnected with inflammation or obvious disease of the nervous centres.*

Neuralgic pains are common, and there is scarcely a part or organ in which they may not occur. They are, however, more frequent in some situations than others, as in the head and face, the back part of the thigh, &c. No doubt, in many instances, what appears to be neuralgic pain, is dependent upon obscure disease of the nervous centres, but which cannot be discovered during life; but it is more frequently the result of reflex action, that is, irritation of the periphery of a nerve or nerves is transmitted to a nervous centre, and transferred to that portion of the sensorium which is in nervous connection with the painful part. In this way derangement of the stomach causes headache; disease of the liver, pain in the shoulder, disease of the hip joint, pain in the knee. In some instances, however, no source of irritation can be discovered, when it may be supposed that the nerve alone is in some way or other affected; but I believe such cases to be rare. Neuralgic pains are characterised by the suddenness of their advent and disappearance, and by being unconnected with the signs of inflammation, but occasionally the part is tender, and sometimes exquisitely tender. The pain comes on in paroxysms, which are usually irregular, but sometimes observe regular periods. The frequency of the paroxysms is uncertain; days or weeks may intervene between them, or they may recur so often, that the patient is scarcely ever free from pain. The character of the pain also varies, but it is nearly always severe, or even agonising. Febrile disturbance is seldom noticed.

The situations in which neuralgic pains are most common, are the head and face (tic doloureux), the back part of the thigh (sciatica), the intestines (nervous colic), the intercostal muscles, and the back, lower part of the abdomen, and thighs in females.

Causes.—In addition to the causes already mentioned of neuralgic pain, pressure upon, or inflammation of, the trunk of a nerve, disordered states of various organs, as the uterus, kidney, liver, &c. the gouty and rheumatic diathesis, malaria, anæmia, &c. may be enumerated.

The most common exciting cause is cold; and where there is a predisposition, fatigue, mental anxiety, intemperance, &c. has often brought on a paroxysm.

Treatment.—From the comparative infrequency of neuralgia, due to functional derangement of the nerve alone, a local source of irritation should always be sought for, and if possible removed. Attention should especially be directed to the spinal column, the organs of digestion, the liver, kidney, and uterus, and derangements of these organs removed. The trunk of the nerve should be carefully examined, and the condition of the nervous centres scrutinised.

For the relief of the paroxysm many different remedies have been employed—where it is intermittent, antiperiodic remedies are very efficient, and of these quinine is out of all proportion the best. It should be given in the manner stated at page 149. Arsenic is next to quinine the most efficacious antiperiodic.

In neuralgia, which is not intermittent, the preparations of iron or zinc should be given in combination with narcotics: the sesqui-carbonate of iron and the valerianate of zinc are the most esteemed of the remedies of this class. Quinine, in moderately large doses, in combination with narcotics, has also been very successful. Other remedies, as the muriate of ammonia, iodide of potassium, oil of turpentine, &c. are said to have been used with benefit. For the relief of pain, narcotics must be given and counter-irritants used; chloroform, taken into the stomach or inhaled, often gives much relief.

Of local remedies, an opiate lotion, belladonna plaster, aconite and chloroform are the best. In obstinate cases, relief has been obtained by injecting into the subcutaneous tissue minute quantities of solution of morphia. It should be remembered that this salt acts much more powerfully when thus injected than when taken into the stomach; not more than one-fourth of a grain should be introduced at one time, and the quantity of fluid should be very small—not more than a few drops. Galvanism has sometimes succeeded when other means have failed.

CHAPTER III.

DISEASES OF THE ORGANS OF SPECIAL SENSE.

As diseases of the Eye are a distinct branch of study in the Indian Colleges, they will not be here noticed.

Diseases of the Ear.

Otitis.—*Inflammation of the lining membrane of the Meatus and of the Tympanum.*

Symptoms.—When inflammation is confined to the meatus external to the tympanum, pain and fulness are felt, and afterwards there are noises in the ear, and the hearing becomes dull. The glands of the neck are sometimes enlarged, and there is usually slight febrile disturbance. The inflammation may subside without suppuration, but very generally, at the end of a day or two, there is free secretion of mucus or muco-puriform fluid, followed by much relief. Sometimes, though rarely, the inflammation extends to the bones of the ear. When the tympanum is affected, pain is very severe, extends to the whole of one side of the head, and is attended with throbbing and tension. There is often much febrile disturbance, and not unfrequently delirium. The inflammation may subside by resolution, or suppuration may occur, the matter bursting through the membrana tympani. In some instances the inflammation extends and reaches the membranes of the brain (page 400).

Causes.—Cold and foreign bodies in the meatus are the most common exciting causes. The strumous or rheumatic diathesis sometimes predisposes to it, as does also an altered state of innervation. Permanent deafness is generally dependent upon disease of the labyrinth affecting the bones, or incurable disease of the brain.

Treatment.—The patient should be kept quiet and his diet restricted; a few leeches may be applied in the neighbourhood of the ear. Fomentations and hot poultices will give some relief. The bowels must be freely acted upon, and diaphoretics and salines used, should there be fever. If, as often happens, the pain is so severe as to prevent sleep, narcotics and anodynes will be required.

Chronic otitis and otorrhœa.—In strumous children, purulent discharge from the ear, often continuing for a long time, is common. It may be due to simple inflammation of the meatus, but when of long standing, is more frequently connected with polypus growths, caries of the bones, and in some cases fungus granulations from the meatus, which may be mistaken for polypi.*

DISEASES OF THE NOSE.

EPISTAXIS.—*Bleeding of the nose.*—Hæmorrhage from the nose is common in young persons, and when they are plethoric, is rather salutary than otherwise. Should it be excessive, or the patient not plethoric, it may generally be checked by cold applications or styptics. If these measures do not succeed, it might be necessary to plug the nostrils. In the advanced stages of exhausting diseases, and especially fevers, hæmorrhage is often very profuse, and should be at once checked. Other diseases of the nose are more surgical than medical, and are not therefore noticed.

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* Erichsen's Surgery.

DISEASES OF THE SKIN.

The skin, like every other portion of the body, is subject to disease. Besides simple inflammation, from which no tissue is exempt, it is liable to affections peculiar to itself, and which are doubtless dependent in many instances upon deranged states of the blood.

Many attempts have been made to simplify the student's labour in acquiring a knowledge of cutaneous diseases, by arranging them in orders and classes. Of these arrangements, perhaps, the best is that of Willan and Bateman, as modified by Dr. Hughes Bennett.

The following is Dr. Bennett's arrangement slighly altered:—

ORDER I.—*Exanthemata.*
- Erythema.
- Roseola.
- Urticaria.

ORDER II.—*Vesiculæ.*
- Eczema.
- Herpes.
- Scabies.
- Pemphigus.

ORDER III.—*Pustulæ.*
- Impetigo.
- Ecthyma.
- Acne.
- Rupia.

ORDER IV.—*Papulæ.*
- Lichen.
- Prurigo.

ORDER V.—*Squamæ.*
- Psoriasis.
- Pityriasis.
- Icthyosis.

ORDER VI.—*Tuberculæ.*
- Lupus.
- Molluscum.

ORDER VII.—*Maculæ.*
- Lentigo.
- Ephelides
- Nœvi.
- Purpura.

ORDER VIII.—*Parasitici.*
- Entozoon folliculorum.
- Acarus.
- Pediculus.
- Achorion Schönleini (Favus).
- Achorion Grubii (Mentagra).

The following are the chief characters of the orders:—

1. *Exanthemata or rashes.*—Red patches, diffused or circumscribed, disappearing on pressure, and usually terminating in desquamation of the cuticle.

2. *Vesiculæ or vesicles.*—Circumscribed elevations of the cuticle, containing clear or slightly opaque lymph.

3. *Pustulæ or pustules.*—The same as vesicles, only that the contained matter is pus.

4. *Papulæ or pimples.*—Small conical elevations of the skin, containing neither lymph nor pus.

5. *Squamæ or scales.*—Patches of thickened cuticle, which are successively shed and renewed, leaving the surface of the cutis inflamed.

6. *Tuberculæ or tubercles.*—Small hard circumscribed swellings imbedded in the skin, of long continuance.

7. *Maculæ or spots.*—Patches of discoloration of the skin, without any other change.

8. *Parasitci.*—Diseases of the skin, believed to be caused by the development of an animal or vegetable parasite.

I.—Exanthemata.

Erythema appears as a red patch or blush, accompanied by a sensation of heat. The redness can be made to disappear by pressure, but almost directly returns. The patches continue for from two or three to ten days, and terminate by desquamation of the cuticle. There is in general but little fever, and it is quite free from danger.

Several varieties of erythema are described. One only requires separate notice, viz. *erythema nodosum.* This appears as raised oval red patches—which are red, hot, and painful—on the front part of the leg, particularly of females. They look as if about to suppurate, but never do so. The red colour changes to blue, and this to yellow or greenish, and so passes off like the discoloration from a bruise. Erythema nodosum is often connected with rheumatism, and is generally accompanied by more fever than the other forms of erythema.

Little treatment is necessary in erythema: a saline purge and rest of the affected part, with a few tonic doses of quinine in erythema nodosum will be sufficient for its cure.

Roseola consists of patches of redness of small size and irregular form, distributed over more or less of the surface of the body. It seems often to depend upon derangement of the stomach, and is usually a slight affection, scarcely requiring treatment. Mild laxatives and saline diaphoretics are the best remedies. Derangement of the stomach should be removed. Of the varieties of roseola that are described, one, *roseola æstiva*, requires notice. It is most common in females and children, and is ushered in by fever, which is sometimes severe, and accompanied by delirium and convulsions. The rash appears on the face and neck between the third and seventh days, and is attended by slight soreness of the throat.

Roseola seems often to depend upon some local source of irritation, and is frequently observed in children during dentition, or who may be suffering from intestinal derangement. In adults it may be traced to the use of improper articles of food.

Urticaria is very common and troublesome, and known as nettle-rash, on account of the resemblance of the eruption to that which is caused by applying the common nettle to the skin. It appears as an evanescent eruption of prominent patches, sometimes redder and sometimes paler than the surrounding skin, and surrounded by a blush. There is much itching and tingling, and not unfrequently a good deal of fever, and when severe and in the acute form, oppression at the precordia is sometimes very distressing. Urticaria is generally of short duration, but there is a chronic form which comes and goes for many months. Urticaria is always due to derangement of the stomach, and can often be traced to the use of certain articles of food; as shell fish, unripe fruit, vegetables, as cucumber, &c. Certain medicines are apt to cause it, as turpentine, copaiba, &c.

In mild cases no treatment may be necessary, the eruption disappearing in a few hours; when itching is great, it may be relieved by a lotion of acetate of lead, or cyanide of potassium; when more severe, and depending upon acute dyspepsia, an emetic should be given, and afterwards an aperient, and if there is much fever, saline diaphoretics. Chronic cases are often very obstinate and troublesome. The diet should be strictly regulated, and alteratives and occasional aperients given. Should this treatment not be sufficient, vapour and sulphur baths may be used, and even a course of arsenic given.

II.—VESICULÆ.

Eczema is an eruption of minute vesicles, closely crowded together, upon inflamed patches of skin, and accompanied by itching, smarting, and tingling. In four or five days the vesicles burst, and the contents dry into thin scales, from beneath which there is a more or less constant discharge, which keeps the part moist. Successive crops of vesicles appear on the surrounding skin. Eczema is generally a local affection, but sometimes occurs on several parts of the body at the same time. Its common seats are between the fingers, on the hands, arms, and in the groins.

Acute eczema is sometimes attended with fever, and generally lasts from a week to a month—the chronic form may contine for many months or even years. Eczema is most common in females, and has been attributed to deranged menstruation. It is also said to be caused by exposure to the sun, or the contact of irritant powders with the skin. Mercury is also said to have occasioned it. In many instances no cause can be traced.

Eczema generally gets well, but is sometimes troublesome to cure. It is probably not contagious.

Treatment.—In the acute form, aperients and diaphoretics, restriction of the diet, and the removal of all exciting causes, constitute the general treatment; and some mild lotion, as that of the acetate of lead, may be applied, and when the itching is very great, opium may be added to it. In chronic cases many remedies have been employed; on the whole, arsenic in small doses seems to be the best. Ointments of oxide of zinc or of the nitric oxide of mercury may be applied, or solutions of the alkaline carbonates. Tar and the oil of cade are sometimes useful

The mildest form of eczema (*eczema simplex*) often appears between the fingers, and on the forearms of women and children. In a more severe form (*eczema rubrum*) the skin is inflamed, hot, and tense, and in a still more severe variety (*eczema impetiginodes*) the contents of the vesicles become purulent.

Herpes.—Herpes chiefly differs from eczema in the vesicles being collected into groups. The vesicles run together and burst, and their contents dry and form a thin scale. Its duration is about a week. There is sometimes slight fever. Different names are given to herpes according to its situation: on the lips it is called *labialis;* on the inner surface of the prepuce *preputialis;* and when it has no particular seat *phlyctenodes.* When occurring in rings it is named *circirnatus* or *iris.* A very remarkable variety of herpes is that known as *herpes zoster* or the *shingles.* It is restricted to one side of the body or of a limb, which it surrounds like a zone or girdle.

Treatment.—Very little treatment is required, as this form of skin disease always runs a favourable course. Mild aperients, refrigerant diaphoretics, and the local application of warm mucilaginous liquids, are all the remedies that are necessary.

Scabies; Itch.—Scabies, a contagious disease of the skin, not rare anywhere, is extremely common in India. It is believed to depend upon the presence of a minute animalcule called the *acarus scabiei.* It shows itself a few days after exposure to contagion as small pointed vesicles, which mostly appear between the fingers, on the wrists and forearm, and at the bends of the joints; but no part of the skin is exempt from the disease, with the exception of that of the face. The vesicles are apt in severe cases to become pustules. The pustular form of itch is that most frequently met with in Bombay. The eruption is accompanied by much itching, and from being scratched, the spots are broken, and covered with thin scales.

Scabies is a local disease, and therefore unattended with constitutional disturbance, with the exception of slight fever, which, in severe cases, is caused by local irritation. It is apt to be mistaken for eczema. It must be remembered, that the vesicles in the latter disease are flattened, and occur in patches, whilst in scabies they are pointed or acuminated, and occur singly.

The treatment of scabies is quite local; it is one of the few diseases for which there is a specific remedy, viz. sulphur. This is used in the form of ointment, the *unguentum sulphuris* of the Pharmacopœia, and should be applied twice in the day.

Pemphigus.—Pemphigus is an eruption of vesicles of various sizes. They first appear as red patches, and afterwards as blisters or blebs, and which are not unlike the appearance presented by a burn or scald. They may either shrink and disappear, or burst, leaving thin scabs, beneath which the cutis is red and inflamed. The most common seats of pemphigus are the face, neck, and limbs. In the mild form the disease usually disappears in four or five days. In more severe cases, the bullæ or blisters are of large size and filled with a straw-coloured fluid. Their formation is preceded and accompanied by fever which may last for a week. Occasionally a single bleb forms and bursts, and then another appears in the same place; this is *pompholyx solitarius.* There is a chronic form of pemphigus which occurs for the most part in old men, is very obstinate, and often extends over the whole body.

The causes of pemphigus are not well known, but it is more common in weekly cachectic persons than in others. Recovery may always be anticipated. In the acute form aperients and saline diaphoretics are alone required. The vesicles may be punctured as they appear, but care should be taken that the cuticle is not rubbed off.

In the chronic form it is generally necessary to endeavour to improve the general health by tonics, and in obstinate cases a course of arsenic may be required.

III.—PUSTULÆ.

Impetigo.—Impetigo is an eruption of small pustules in clusters, which in a few days burst, and are covered with thin yellowish scabs. The skin beneath is red and inflamed, and moistened by a sero-purulent fluid. Impetigo is uncertain in its duration—it may disappear in a week or last for several months. The eruption often appears upon the face in well-defined patches, especially in young children during dentition, and may be preceded by gastro-intestinal irritation. This form is called *impetigo figurata.* When the clusters are scattered over the limbs, it is named *sparsa.* This form is often chronic, lasting for many months.

Impetigo larvalis, or crusta lactea, is another form which is confined to infancy, and almost always appears on the ears, lips, and cheeks. After the pustules have burst, scabs form, which may cover the greater part of the face.

Children are more predisposed to impetigo than adults, possibly owing to the effect of dentition. Amongst the exciting causes, are irritating substances applied to the skin, impure air, and want of cleanliness.

Impetigo may be distinguished from eczema by being *pustular* instead of *vesicular*, and by the greenish scabs; from porrigo by not affecting the hairs and by not being contagious.

The prognosis is always favourable, but the disease is sometimes difficult of cure.

The acute form must be treated upon antiphlogistic principles, viz. by restricting the diet, and administering mild aperients and cooling drinks. Emollient and mucilaginous applications should be applied, as warm fomentations, the tepid bath, milk and water, the almond emulsion, &c. The surface may be protected by a thin layer of ointment, or by glycerine. Itching may be relieved by a lotion containing prussic acid.

In the chronic form, alkaline lotions, or the sulphur bath, stimulating ointments, &c. are required. The iodide of sulphur is much recommended. In obstinate cases arsenic internally is indicated.

Ecthyma signifies a pustular eruption which begins as circumscribed red spots, in the centre of which the pustules appear, and increase in size. In a few days they burst, and a dry scab forms, underneath which the skin may be merely discoloured, or, as often happens in unhealthy persons, ulcerated.

In *acute* ecthyma there is constitutional disturbance, as lassitude, loss of appetite, pains in the limbs, &c. After the disease has run its course the pustules do not return.

In *chronic* ecthyma successive crops of pustules continue to come out for several months, and deep unhealthy ulcers are often left upon removal of the scabs.

Ecthymatous eruptions are usually connected with a depraved state of health, and are therefore common in persons, and especially children, who breath impure air and are badly fed. They also sometimes follow the eruptive fevers.

Ecthyma may be distinguished from other pustular eruptions, by the large size of the pustules, and the inflamed and hardened base on which they rest. From small-pox pustules they differ in the absence of a central depression.

Acute cases require little treatment: saline aperients, and the removal of stimulants, with the use of emollient applications, constitute the measures that are to be employed.

In chronic cases tonics, the mineral acids, alteratives, iodine, nutritious food, pure air, and alkaline baths, &c. are indicated.

The ulcers may be touched with the nitrate of silver, and dressed with some simple ointment.

Acne is disease of the sebaceous follicles, which shows itself as small, red, conical indurations, the summits of which become pustules. They afterwards enlarge and form indolent nodules, at the top of which is a small scab, resulting from the rupture of the pustule and the drying up of its contents. The eruption is common on the face, but frequently occurs on the back and chest. It is most often met with in young persons.

When some of the small nodules coalesce and form indurated tumors, in which suppuration takes place very slowly, the disease is called "*acne indurata.*" In middle aged or old persons, the skin, generally of the side or end of the nose, sometimes becomes of a deep red colour, which, at first, for a time disappears and returns, but soon becomes permanent, and pustules form upon it. The part swells and bluish lines may be seen, caused by enlargement of the small blood vessels. The redness may be confined to the nose or extend to the face. The form of acne now described is called "*rosacea.*" It is thought to be connected with intemperate habits, both in eating and drinking, and is often dependent upon derangement of the stomach. When of long standing, in persons at all advanced in life, it is very difficult of cure, if not incurable.

When acne is recent, and occurs in young persons, a restricted diet, the avoidance of all stimulating liquors, and mild aperients, are the measures to be adopted.

When chronic, alterative and such other medicines as are calculated to remove any derangement that may be present, and various local applications, as the iodide of sulphur, sulphur and milk, nitrate of silver, or a lotion of the bicyanuret of mercury are to be used.

Rupia is an exaggerated form of ecthyma, occurring for the most part in weakly persons. The pustules burst and scabs form, underneath which there are often deep unhealthy circular ulcers, which it is sometimes difficult to heal. The most common seat of rupia is the lower extremities. The eruption may last for a few weeks or extend over several months.

The general health should be in every way improved by tonics, alteratives, pure air, &c. At first emollient applications may be used, and alterwards the ulcers treated according to their characters.

Sycosis is the formation of small vesicles or pustules upon those parts of the face on which the beard grows. Each pustule or vesicle is traversed by a hair. There is at first much tension, with redness, and smarting. In three or four days the pustules burst, and thinnish brown scabs are formed. When these fall off, there may be recovery, or successive crops of pustules may appear. In cases of long standing, the cuticle becomes thickened so as to form tubercles. Sycosis is caused by irritation and want of cleanliness. Some persons believe it to be contagious, and to originate in the development of a vegetable parasite.

At first emollients should be used, and afterwards applications similar to those employed in acne. The beard should be cut close with scissors, in place of being shaved with a razor.

IV.—PAPULÆ.

Lichen appears as small red pimples, often in clusters, attended by heat, itching, and tingling. Their most common seats are the hands, forearms, neck, face, and breast; but they may occur elsewhere. The course of lichen is generally chronic, and it ends in desquamation.

Several varieties of lichen are described. The *lichen tropicus* or *prickly heat* is common in tropical countries, and is well known on account of the itching and tingling which attends it. It generally disappears in the cooler seasons of the year, and when present, is always aggravated by everything which increases secretion from the skin, as exercise, drinking stimulating liquors, or, indeed, taking any fluid, even water. Though free from all danger, it is very troublesome, and in children, during the hot season, often lays the foundation for ill health by interfering with sleep.

The irritation from it may sometimes be allayed by dusting the skin with a dry powder.

Lichen sometimes attacks children at the breast, and lasts for two or three weeks. It is then known as *lichen strophulus* or tooth rash.

Occasionally the pimples appear in the form of a ring, causing the variety called *circumscriptus* or *ring worm*. The most severe form of lichen is named *agrius*. It begins with fever, the papulæ are small and very numerous, and surrounded by inflamed skin. Another variety, in which the spots resembles the sting of a nettle, has been called *urticatus*.

Lichen is caused by heat and by irritants applied to the skin. It is sometimes dependent upon gastric derangements, and in children upon the irritation of teething.

The more severe forms, when acute, require mild antiphlogistic treatment, and emollient applications. In the chronic varieties, stimulating lotions and ointments, as of the subcarbonate of potass, of the iodide and biniodide of mercury, &c. are the best remedies.

Prurigo consists in an eruption of minute pimples of the colour of the skin, and accompanied by great itching. It is generally chronic and without fever, and often confined to one spot, as the organs of generation. From being scratched, on account of the almost intolerable itching, the summit of the papules is often marked by a dark-coloured spot, caused by a minute coagula of blood.

Many varieties of prurigo are distinguished, but they do not, for the most part, present such peculiarities as to require separate notice. One variety, *prurigo senilis*, confined to old people, is often accompanied by numerous pediculi. The causes of prurigo are not well known, but it is favoured by cahectic states of the system, and want of cleanliness, and irritation of the skin. It is often, and especially in old persons, difficult of cure.

In the treatment of prurigo, any derangement that may be present should be remedied, and in weakly persons tonics should be given. The local applications most used are stimulating and anodyne liniments and ointments. Amongst the former, spirit lotions, solution of acetate of ammonia, &c. and of the latter, sulphur or mercurial ointment, iodide of sulphur, oxide of zinc, &c. Of other remedies sometimes successful, may be mentioned tar, creosote, nitrate of silver, sulphur baths, the mixed vapours of iodine and sulphur, &c. Pediculi may be destroyed by a lotion of the bichloride of mercury.

V.—SQUAMÆ.

Psoriasis appears in raised patches of irregular shape, covered with a white scale. It is unattended by febrile disturbance, and is chronic in its course. Its usual seats are the eyelids, lips, prepuce, and scrotum, back and palm of the hands, and the nails.

In its severe form (*psoriasis invetera*), which generally occurs in old weakly persons, the skin becomes hard and thickened, and when the scales are removed, its surface is red, painful, fissured, and bleeding. Names have been given to psoriasis according to its situation and the arrangement of the patches, as *psoriasis palmaris*, *dorsalis*, *diffusa*, *gyrata*, &c. but a separate description of them is necessary. Psoriasis is sometimes caused by handling dry powders, and is common in bakers. It may be hereditary, but in many, perhaps in most instances, no cause can be assigned. It is nearly always curable, although sometimes obstinate.

Treatment.—At first restricted diet and aperient medicines, and emollient applications; afterwards alterative medicines; and in severe cases, arsenic, iodine, mercury, &c. The best local applications are tar ointment, or an ointment of the iodide of sulphur (grs. x vel xii ad ℥j). Sulphur and vapour baths are useful. Dr. Guy states, that the itching and smarting are sometimes greatly relieved by a lotion consisting of ten grains of cyanide of potassium in six ounces of almond emulsion.

Lepra does not differ from psoriasis, except that it occurs in well-defined circular or angular patches, which are most commonly situated in the neighbourhood of the large joints. It seldom appears on the face or hands. The treatment is the same as that for psoriasis.

Pityriasis—dandriff—appears as small circular patches of a yellowish or red colour, and accompanied by more or less itching. After a time the scabs separate as a whitish powder. It commonly occurs on the scalp, but may appear in other situations. In one form (*pityriasis rubra*) the spots are red, and often spread over a considerable extent of skin.

Pityriasis is said to be caused by irritation of the skin, and to occur in persons who are debilitated; but in many instances no cause can be traced. It is often difficult of cure. The remedies used are tepid baths, tonic and alterative medicines, and various stimulating ointments. There is a form of pityriasis (*p. versicolor*) which appears as small grayish or reddish stains on the skin, which afterwards become of a brown yellow colour. They spread and often attain a large size, but are attended with little inconvenience. There is reason to attribute this form of pityriasis to a vegetable fungus.

Icthyosis is in general a congenital disease, in which a part or the whole of the body is covered with hard, thick, brown scales, which have been compared to the scales of a fish. There is neither pain nor constitutional disturbance, but the disease is incurable.

VI.—TUBERCULÆ.

Lupus is usually observed on the skin of the face, and especially of the nose. It generally appears as dull, red, indolent tubercles, which sometimes ulcerate. Two forms require notice, viz. *lupus exedens* and *non-exedens*.

Lupus exedens.—In this form a scab is seen upon the top of the tubercle, beneath which is an ulcer, which spreads. Fresh tubercles appear on the surrounding skin, and they also ulcerate. As the ulceration extends, the central part often cicatrises. The surface of the skin only may be destroyed, or the ulceration may extend deeply; in the latter case, the nose and a part of the face may be eaten away, and the disease even reach the palate and gums. The surface of the ulcer is uneven, and the edges are thickened and red. Its progress may be slow or rapid: the entire nose has been destroyed in a month, but in other instances many months have passed with but little extension of the disease. Should the ulcer heal, cicatrices will always be left. Lupus exedens sometimes occurs as a phagedenic ulcer of the skin, without tubercular thickening.

Lupus non-exedens chiefly differs from *lupus exedens* in the tubercles being softer and less prominent; there is no ulceration, but the structure of the skin is altered, so that it is marked by pits or depressions, or traversed by scar-like ridges.

Lupus is difficult of cure, and the ulcerative form is not unattended with danger; its causes are unknown, but it is believed to be in some cases connected with the scrofulous diathesis.

The constitutional treatment consists in the use of cod-liver oil, iodine, arsenic, &c. Before ulceration, and in the lupus non-exedens, the best local remedies, are acetum cantharidis or stimulating ointments, as of the iodide of sulphur, mercury, &c.

After ulceration, the local remedies usually employed are those which destroy the ulcerated surface, as strong nitric acid, chloride of zinc, &c. Arsenic has been used for the same object but it must be well diluted, and applied over only a small extent of surface at one time.

Molluscum consists of small tubercles occurring in groups. They vary in size from a pea to a pigeon's egg, and are pedunculated, globular, or flattened. They contain atheromatous matter, and exhibit no tendency to inflammation or ulceration. They do not effect the general health, and often become stationary. One form of molluscum is thought to be contagious.

Attempts may be made to discuss these little swellings by friction and the use of slightly stimulating applications, as a solution of sulphate of zinc or corrosive sublimate. No constitutional treatment is likely to be of service.

VII.—MACULÆ.

Ephelis or liver spots appear in small round spots of a brown colour, which run together, and form patches of considerable size. They are unaccompanied by pain or itching, and are often attributed to exposure to the sun, and in the female to disturbance of the function of menstruation. They are not uncommon in pregnancy. No treatment is necessary; they are not of long continuance, and generally disappear of their own accord.

Nœvi or moles are spots of discoloration of the skin, generally of small size, and often covered with hairs. They are congenital, cause no inconvenience, and require no treatment.

VIII.—Parasitici.

Scabies, which depends upon the development of a minute animalculi (*acarus scabiei*), has been already described (page 471). Another entozoon (*entozoon folliculorum*) is sometimes found in the sebaceous follicles, and especially in those of the face, but it does not seem to cause inconvenience.

Vegetable parasites on the surface of the skin are often seen. There is as yet, however, some doubt as to whether they really cause the diseases with which they are associated, or are the result of it; that is, whether the changes produced by the disease may not constitute a favourable nidus for parasitic developments.

Favus or porrigo generally occurs on the scalp. It appears as small spots of a bright yellow colour, having a depression in the centre. They are at first circular, but as they enlarge they press against one another and assume a hexagonal or honeycombed appearance. As the spots increase in size the edges are elevated, and the central part of the spot has a powdery consistence. This encroaches upon the edges and forms a crust, around which there is in general a ring of inflammatory redness; at length, according to Dr. Bennett, from whose work the above description is taken, "the whole cracks or splits up; all regular form is lost; a dense thick crust covers the scalp; an odour like the urine of cats or mice is evolved; and, in chronic cases, vermin deposit their eggs in the interstices, and crawl in large numbers over the surface." At first there may not be much uneasiness, but as the disease progresses, there is intolerable itching, and from the part being scratched, blood is sometimes effused, and pustules form, or suppuration is caused.

Favus is most common on the face, but may occur in many other situations. When attacking the chin it is believed to be one form of "mentagra." The constitutional symptoms are always indicative of cachexia, and in many instances of scrofulous cachexia. One form of favus is of a scaly character, and is called *pityriasis versicolor*.

Favus is most common in children between the ages of three and twelve years. It can be communicated by contagion—but with difficulty—upon the unbroken skin of healthy persons.

When porrigo assumes the form of a honeycomb, it is called *favosa* or *lupinosa.* The parasite which is by some supposed to cause it, is the *Achorion Schoenleini.*

When arranged in the form of rings, porrigo is named *scutulata* or *ringworm.* In this variety the hair falls off and bald patches are left. The *Tricophyton tonsurans* is thought to cause it.

In the treatment of favus, the general health must be improved by cod-liver oil, tonics, &c. The hair should be cut close, and the crusts softened by warm water and poultices. When the crusts have been removed, a lotion of sulphurous acid or the iodide of sulphur ointment should be applied. If these fail, the nitrate of silver, or the mixed vapour of iodine and sulphur may be tried.

Two vegetable fungi, the *Tricophyton tonsurans* and *sporuloides* have been found in connection with a peculiar affection of the hair follicles, in which the hairs are swollen and glued together by a viscid secretion. The disease is known as *plica polonica.*

Furunculus or boil.—Circumscribed inflammation of the skin, causing a troublesome affection, familiarly known as a boil, is common, and especially in tropical countries. Two kinds of boil may be recognised : one appears as a minute but very painful pustule, surrounded by a blush of redness, and slowly increases in size, but never becomes larger than a pea. The other shows itself as a small, hard swelling, of a red colour, which may become as large as a hen's egg. It is at first flat, but becomes pointed as it enlarges, and slowly suppurates.

Boils sometimes subside without suppuration, but more frequently a little pus forms, which is discharged by one or several openings. A slough of areolar tissue called the *core* remains, which requires several days for its separation. Upon its removal the cavity quickly heals, but a small scar is sometimes left. Boils often come out in successive crops, lasting in some persons for several months. They may occur in any part of the body and limbs, and are common on the face. In the hot seasons of the year, *lichen tropicus,* or prickly heat, sometimes merges into them. As regards treatment, the boil had better be left to itself. Leeches, poultices, and incisions delay, but do not arrest, its progress. When successive crops appear, some persons think benefit is derived from a course of sarsaparilla and liquor of potash. The diet should be generous, and quinine is said to be useful. For my own part, I have little confidence in any kind of treatment in this troublesome, but otherwise unimportant, disease.

ANTHRAX OR CARBUNCLE.—A much more serious affection, resembling a boil on a large scale, is that known as carbuncle. It occurs only in persons whose general health is deranged, and appears as a large, flat, hard, circumscribed swelling of a dull red colour ; this slowly becomes more prominent, and spreads at the circumference, until in some instances it attains the size of a dinner plate. It is attended with severe burning pain. At length, soft fluctuating spots may be detected in various parts of the swelling, and when these are opened, a little sanious pus and shreds of sloughy tissue escape. Afterwards the skin becomes extensively undermined, and may slough from the subcutaneous areolar tissue being destroyed. There is much constitutional disturbance, and not unfrequently a tendency to drowsiness and coma. Carbuncle often occurs in persons suffering from diabetes, and is frequently situated upon the back or nape of the neck. In the treatment of carbuncle, the general health should be supported by nutritious diet, tonics, and stimulants, opiates must be given to relieve pain. Fomentations and poultices may be applied to the swelling, and when it becomes boggy and fluctuating, but not before, incisions may be made into it. The practice of making early crucial incisions, unless there is much pain from tension, is not to be recommended.

SECTION IV.

GENERAL DISEASES.

The diseases described in this section cannot be located in any part or organ, and may therefore be considered as affecting the whole system. Many of them are probably due to an altered state of the blood.

CHAPTER I.

FEVERS.

Fever is a prevalent and fatal disease in all parts of the world. Its importance in tropical countries can be scarcely over estimated. According to Dr. Morehead, 27,212 persons died from it in Bombay in five years, being about 40 per cent. of the total mortality.

Fevers, for practical purposes, may be arranged according to their real or supposed causes.

1.—Fevers from the ordinary causes of disease, as cold, &c.
2.—Fevers from malaria.
3.—Fevers from contagion.
4.—Fevers from high temperature.

1. Simple continued fever or febricula.—From exposure to cold or errors in diet, febrile symptoms often occur and continue for a few days, the usual period being from one to ten days. The attack comes on suddenly, with chilliness, lassitude, and pains of the limbs, followed by headache and heat of skin; the pulse becomes frequent and full, or frequent, small, and wiry, and the tongue coated and sometimes dry; the urine is scanty, and the bowels are constipated. The nights are restless or sleepless, and in severe attacks the patient is delirious. Much aching pain is complained of in the limbs and back. In some cases there are catarrhal symptoms, or symptoms of hepatic derangement

and this has led to the unnecessary division of febricula into catarrhal and bilious. Simple continued fever is not infectious, and is unattended with danger.

Treatment.—Mild aperients and saline and diaphoretic medicines should be given: and in India, where all fevers exhibit, more or less, a periodic tendency, quinine may be prescribed in the remissions.

Malarious Fevers.

By malarious is to be understood fevers which are caused by malaria (page 105). Their prevalence in tropical countries is too well known to require comment. There are two principal varieties, viz. *intermittent* and *remittent.*

Intermittent Fever, or Ague.

The distinguishing character of intermittent fever is, that at some time or other after its accession, the febrile symptoms altogether subside (*intermission*), the period of recurrence being each time at or near the same hour. The period which intervenes between the commencement of one and that of a succeeding paroxysm is the *interval,* and its length determines the type of the fever. When it is 24 hours the type is *quotidian,* when 36 hours *tertian,* and when 72 hours *quartan;* or in other words, quotidian fever has a daily paroxysm; *tertian* one upon every alternate day, and *quartan* upon every third day. Other varieties, depending upon irregularities in the paroxysms, are called "double;" but when anti-periodic medicines are used, they are recognised with difficulty, and in practice the distinction is of little importance.* In most cases, as already mentioned, the paroxysm occurs each time at the same hour, but it may be earlier or later in its onset, when the fever is said to be *anticipating* or *retarding.* An *anticipating* tertian may be changed into a quotidian, with of course an increase of its severity, and a *retarding* quotidian into a tertian, with a decrease of its severity.

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* The more common of the *double* forms are as follows:—In quotidian there are two daily paroxysms; in tertian there is a paroxysm every day, the paroxysms on alternate days being alike, and differing from those of intervening days; in quartan, out of three days two have each a paroxysm and the other none.

Symptoms.—A paroxysm of ague may be preceded by some of the usual premonitory symptoms of fever, as loss of appetite, lassitude, uneasiness at the epigastrium, &c., but very often it sets in quite suddenly. When fully formed, three stages can be recognised, viz. a *cold*, *hot*, and *sweating* stage.

Cold stage.—The cold stage commences with yawning and stretching, a feeling of chilliness, at first in the back, but which soon spreads over the body, followed by rigors; the patient begins to shiver, and sometimes the shaking is such as to move the bed on which he lies. The teeth chatter, that is, they are struck together by the shaking of the lower jaw, and emit sounds which may often be heard at some distance. The skin is generally cold, rough, and shrunken, and has been compared to the skin of a plucked goose (*cutis anserina*). The ears and tips of the fingers are blue; the breathing is hurried and oppressed; and there is a sense of weight and oppression at the epigastrium. The pulse is small and for the most part frequent, though sometimes slow; the tongue is not necessarily altered; the appetite is lost, and there is generally nausea, and sometimes vomiting. The urine is frequently passed, and is pale and limpid. Pains are complained of in the back and limbs. The mind is generally depressed, and sometimes there is wandering and delirium.

Hot stage.—After a period, varying from a few minutes to several hours, flushes of heat are experienced, alternating with chilliness, and these are gradually followed by persistent heat of the skin. The cheeks are now flushed, the patient's breath feels hot, and the skin is dry and pungent. There is dryness of the mouth and thirst, and the tongue becomes furred. The appetite is not only lost, but there is loathing of food. The secretions are scanty, as evidenced by the dry skin, scanty high-coloured urine, and constipated bowels. Very frequently there is much nausea, and sometimes vomiting. Headache is generally complained of, and in many cases is very severe. In severe attacks there may be delirium, but this is rare. The pulse is full and frequent, and the respiration hurried, though less oppressed than in the cold stage.

Sweating stage.—At length moisture is perceived upon the forehead, and there is some relief of the febrile distress; sweating soon becomes general, and the symptoms altogether subside; the patient usually falls asleep, and awakes free from fever or sweating. It must be noticed however, that in cases of long standing, or in very asthenic persons, the sweating is sometimes accompanied or followed by symptoms of collapse, viz. cold clammy skin, a feeble or imperceptible pulse, pinched and sunken features, &c., and which not infrequently terminates in death. And it must not be forgotten, that the probability of this occurrence is not to be judged of by the severity of the hot stage; but on the contrary, as explained by Dr. Morehead, it is often preceded by a diminution in the degree of febrile reaction. The same distinguished authority also states in reference to this point, that "a failing pulse, increasing emaciation, and decreasing heat, ought to lead us to anticipate early and rapid sinking at the close of a paroxysm, and to provide against it by assiduous care in the use of appropriate stimulants and nourishment." The length of the paroxysm is subject to great variety; it may be over in an hour or two, or continue almost until the next paroxysm commences. It is well known to be longer in quotidian than in tertian, and in tertain than in quartan. It is generally stated to last ten or twelve hours in quotidian, six or eight in tertian, and from four to six in quartan. The stages also vary in length in different types: the cold stage is longer in tertian and quartan than in quotidian, and the hot stage is longer in quotidian than in the other varieties. The hot stage is more severe in sthenic persons newly arrived within the tropics, than in the older residents and natives. The tongue also is more coated in sthenic than in other persons, and in quotidian than in the other types. In tertian, in asthenic natives, Dr. Morehead describes it as being sometimes quite clean. The commencement of the attack is stated to be the early morning in quotidian, noon in tertian, and afternoon in quartan. In regard to frequency, the tertian is said to be the most, and the quartan the least common; but the first part of this statement is not in accordance with the experience of the best observers in India.

Masked fever.—The duration of the stages may be relatively curtailed or lengthened. Thus, the attack may begin with the hot or sweating stage, or the cold stage may not be followed by either the hot or sweating stages, or this stage is prolonged, and the subsequent stages are so short as to escape notice. This is "masked fever." When congestion, which is more or less general, predominates in certain organs, unusual symptoms may be present. When it is chiefly in the head, there may be drowsiness, giddiness, noises in the ears, &c.; when in the heart and great vessels, oppression at the precordia, sighing respiration, and a very feeble pulse; when in the stomach and intestines, vomiting and diarrhœa. Persons who have suffered from intermittent fever, and have been to all appearance cured, are liable to recurrence, in the form of a few paroxysms, or it may be of a single paroxysm. These attacks sometimes observe regular periods.

Pathology.—It is generally believed, that ague or intermittent fever is due to a poison in the blood, which is known as malaria, and that there is no other cause of it. The occurrence of a paroxysm at long intervals, may be viewed as an attempt set up by the system to eliminate the poison which had been accumulating since the preceding attack. In the *cold* stage, the blood circulates languidly, and there is a tendency to congestion in all internal organs, and this is probably the result of the sedative influence of the poison upon the heart. Sometimes this depressing influence is so great, as to cause death by syncope. In the *hot* stage, determination of blood to various organs is apt to occur, and to be followed by inflammation, but the latter is not very common. After repeated attacks, certain organs become enlarged, as the spleen and liver. The spleen is so often affected, that the swelling has been popularly called the "ague cake." Sometimes the swelling is so great, as to occupy a considerable part of the abdomen. It at first arises from simple congestion, and is then readily removed, but after repeated attacks, deposits and thickening take place, and the swelling is more or less permanent. Dr. Morehead has pointed out the occasional co-existence of a systolic cardiac murmur and increased precordial dulness when the spleen is enlarged—the former he relates to an altered condition of the blood, the latter partly to displacement of the heart, and partly to defective expansion of the lung.

Of other, though rare complications of intermittent fever, may be mentioned bronchitis, jaundice, diarrhœa, dysentry, and head symptoms. In regard to head symptoms, it should be noticed that they sometimes occur at the commencement of the cold stage, and occasionally assume so much prominence, as to take the place of the febrile paroxysm; at other times, and more frequently, they accompany the hot stage. They do not generally depend upon cerebral lesion, but in some instances they may be due to chronic meningitis.

But the most important circumstance in connection with the pathology of ague, is the tendency it has to cause "cachexia," a state in which there is a predispositon to the action of the exciting causes of all diseases. In tropical countries, the part most frequently affected is the intestinal canal, leading to diarrhœa and dysentery, from which the mortality is great. Intermittent fever prevails most in the hot and rainy seasons—bowel affections occur most frequently in the cold months.

Cause and effects.—Mild intermittents often terminate after a few paroxysms without treatment; but more severe cases, unless checked by proper remedies, run on for many weeks or months. The tendency of one type to pass into another type has already been mentioned, as has also the tendency to a periodical return of the paroxysms. Intermittents of long duration are accompanied and followed by enlargement of the spleen and liver, and derangements of other organs are often noticed. The anæmia which is almost certainly the consequence of them, is not unfrequently attended by dropsy.

As already mentioned, a true intermittent has one cause only, viz. malaria. It is quite true, however, that the poison may be for long latent, and that the attack may be immediately excited by exposure to cold, mental excitement, improper food, &c. Persons who are debilitated from any cause, are more easily acted upon by malaria than others.

It is a popular belief in India, that attacks of intermittent fever are in a remarkable degree frequent at the changes of the moon, and this belief is shared by many medical officers of experience. There are no *facts* recorded in support of this belief; on the contrary, it may be affirmed, that all the facts which are recorded upon the point are adverse to it.

Prognosis.—The prognosis in uncomplicated intermittent fever is favourable, although the possibility of death by exhaustion, especially at the end of a paroxysm, should not be lost sight of. But notwithstanding that it is not in itself fatal, it is often the commencing link in the chain of causes which lead to some of the most fatal diseases in tropical countries.

Diagnosis.—Hectic fever is the only disease for which intermittent fever is liable to be mistaken. The irregularity in the periods of attack; the short or wanting cold stage; the short hot stage; and the prolonged sweating, will in general be sufficient to distinguish hectic fever from ague. In doubtful cases, local disease should be carefully sought for.

Treatment.—In the treatment of intermittent fever, *two* principal objects must be kept in view, viz. to lessen the severity of the paroxysm, and to prevent its recurrence.

Treatment of the paroxysm.—If a paroxysm is impending, but the cold stage is not established, an emetic or an opiate may be given with advantage—the former is best suited to cases in which the tongue is furred, the patient's constitution good, and the disease of short duration. After the cold stage has come on, the patient should be well wrapped up in warm clothes; his thirst may be relieved by warm drinks, and should the depression be very great, heat may be applied, and stimulants given. In the hot stage, the skin should be sponged with tepid water, whilst cold is applied to the head, and mild diaphoretics and antimonials are administerd. Acetate of ammonia and tartar emetic or ipecacuanha are the best of such remedies. Should there be determination of blood to any part or organ, as the head or stomach, &c. leeches may be applied, but they must be used with much caution after the first few paroxysms. In cases where the tongue is coated, expanded, not florid at the tip and edges, the bowels confined, and the stomach not irritable, Dr. Morehead recommends, in the first or second paroxysm, at the commencement of the hot stage, an emetic of ipecacuanha, followed by a mild purgative.

In the sweating stage, little is required beyond protecting the patient by proper clothing from the effects of too rapid evaporation. In cases of long standing, or in persons who are asthenic, much watchful care is necessary towards the close of this stage, in order to detect the first appearance of collapse, when stimulants should be freely given.

It is not supposed that by these, or by any other means, the paroxysm can be cut short, or its duration materially lessened.

Treatment of the intermission.—The treatment of the intermission may be stated in almost a word to consist in the administration of a medicine or of medicines which are capable of preventing the paroxysm. It need hardly be said, that such remedies are called antiperiodics. They should be used in the first intermission.

Of antiperiodic remedies, quinine is the only one upon which reliance can be placed in all cases. It does not seem to be a matter of much importance whether this medicine is taken in one large dose or in several smaller doses, provided that the whole quantity be given two or three hours before the time of the expected paroxysm. I prefer, as a general rule, giving it in doses of from five to eight grains, and repeating the dose every second hour, until from twenty to thirty grains have been administered. It sometimes happens however, that the paroxysm is expected in an hour or two after the patient is seen, in which case, a single dose of fifteen or twenty grains should be at once given.

The quantity of quinine that may be necessary varies in different cases, according to the duration or malignancy of the attack. In my own practice, it has not been found requisite to administer a larger quantity than sixty grains in one day, and very rarely indeed more than thirty. When there is much anæmia, I am disinclined to use large doses, from having more than once witnessed very alarming collapse induced by them.

Other antiperiodics besides quinine are sometimes used. *Arsenic* is perhaps the best known of them. In quantities of less than one drachm and a half of the liquor potassæ arsenitis (three-fourths of a grain), it may be doubted if it is possessed of active antiperiodic properties, and I make this statement after having repeatedly prescribed it in those quantities. Whether its febrifuge power is greater in the larger doses in which it has sometimes been given, I am unable to say from my own experience. There has been at times so much suffering from even the limited quantities in which I have employed it, that when quinine is procurable, I do not feel justified in testing them.

Of other antiperiodics, my experience is very limited, but the few I have tried have given me but little confidence in their efficacy.

The use of purgatives is no part of the treatment of intermittent fever after the first or second paroxysm; but if the bowels are confined, they should be moved by a gentle laxative.

Treatment of intermittent fever with enlarged spleen.—In most cases, when the paroxysms are checked, the enlargement of the spleen begins to diminish; the anæmia which is usually present may be removed by combining with small doses of quinine the sulphate or the tincture of the sesquichloride of iron. It need hardly be said, that a nutritious diet and pure air are very essential. In obstinate cases, iodide or bromide of potassium may sometimes be used with benefit, and the tincture of iodine applied to the skin over the swelling. Blisters are objectionable, since they are often followed by sloughing; and mercury in any form is contra-indicated, as there is no condition of the system which is more intolerant of this drug than that now under consideration.

When the usual remedies fail, change should be recommended to a colder climate—the hill sanitaria of India are suitable in the hot seasons of the year; but as regards Europeans, removal to a temperate region is often indispensably necessary.

The treatment of intermittent fever, complicated with chronic enlargement of the liver (not inflammatory), is the same as when it is complicated with similar enlargement of the spleen.

REMITTENT FEVER; *Bilious Fever; Miasmatic Fever.*

Remittent is next to intermittent the prevailing fever in India, and has the same cause, viz. malaria; but differs from it in the circumstance, that there is not a complete subsidence of the febrile symptoms, although at some time or other in the twenty-four hours they are lessened.

Symptoms.—The attack mostly sets in somewhat suddenly, or if there should be premonitory symptoms, they are of short duration, and in this respect there is a marked difference between remittent and typhoid fever, the premonitory stage of which is generally long. The first symptom is slight chilliness, which is soon followed by heat of skin. When fairly established, the symptoms do not materially differ from the symptoms of the hot stage of intermittent fever, except that the tongue is in general more furred, the headache more severe, and the secretions more suppressed. There are the same pains of the limbs and back, flushing of the face, pungent skin, frequent pulse, thirst, nausea, and vomiting. After febrile symptoms have continued for from six to eighteen hours, they begin to abate: the skin becomes moist and less hot, the pulse is reduced in frequency, the tongue is less furred, and there may be a slight return of appetite for food. Sometimes the whole skin is covered with perspiration, and the febrile symptoms may be so much relieved, that the patient falls into a refreshing sleep. The fever is now said to have *remitted*. The remission may take place at any time in the twenty-four hours, but is most common in the morning. Its duration is from an hour or two to several hours, and is followed by a recurrence of the febrile symptoms, *i. e.* the *exacerbation*. The exacerbation may be preceded by chilliness, as at the onset of the attack, but generally it is not. After each exacerbation, the remission becomes shorter and shorter, until the fever attains its height. At this stage the following are the most prominent symptoms: skin hot and dry, and often yellowish; pulse above 100, and often 120; tenderness at the epigastrium, nausea and sometimes vomiting; an irregular state of the bowels; suffusion of the eyes; headache, and sometimes delirium.

The intensity of the febrile reaction has, in some degree, reference to the constitution of the patient, being often great in sthenic persons, and especially in those who have been exposed to malaria soon after their arrival within the tropics. When remittent fever occurs in such persons, the skin is pungent, the pulse full and firm as well as frequent, and there is much nausea and vomiting. This form of fever is sometimes called *inflammatory*, but this designation does not seem necessary, and is open to objection.

Progress.—In favourable cases the exacerbations are checked by medicine or disappear of their own accord, or becoming shorter and less severe, gradually cease. In less favourable cases, the paroxysms becoming longer, and the remission less marked, death may occur by coma at an early period. In asthenic persons, or in sthenic persons when the attack is prolonged or treated by too much depletion, or where the malarious influence is very intense, there is scarcely any appreciable remission; the tongue becomes dry and brown, and the pulse rapid and feeble; sordes collect upon the lips and about the teeth; the urine is retained; petechial spots appear on the skin, and hæmorrhages occur; there is low muttering delirium, followed by drowsiness, coma, and death.

In some cases death is more sudden, and takes place by collapse at the termination of an exacerbation, as explained under intermittent fever; and as justly insisted upon by Dr. Morehead, this result is most likely to happen when depressant measures of treatment have been adopted towards the close of a paroxysm.

The exacerbation sometimes returns at fixed times, thus assimilating the fever in type to the intermittent forms. The quotidian, having a paroxysm every day, is said to be the most common; tertian is not rare, but the quartan form is seldom seen. Whilst making this statement upon the authority of others, I think it right to say, that I have not in my own practice been able to recognise these types of remittent fever.

There is every possible variety in the length of the *remission* and *exacerbation*—in some instances the former is so short, that it may escape observation, the fever appearing to be continued; in other cases, the latter is so slight and transient, that the time of its advent and departure can scarcely be determined. Sometimes the exacerbation is double, occurring twice in the twenty-four hours; cases of this kind are usually severe, on account of the length of the febrile state; and it has also been observed, that there is a tendency for their severity to be still further increased, by the fever becoming continued and adynamic.

Remittent fever with badly-developed symptoms.—Dr. Morehead has directed attention to a form of remittent fever, in which the stages of the paroxysm are irregular: the exacerbation is badly marked, and may indeed chiefly show itself by restlessness or fretfulness, or slight delirium and tremulousness of the hands, nausea, or vomiting. The remission is distinct, but the nights are restless. Dr. Morehead states, that " with each recurring exacerbation, the pulse loses strength, the tongue becomes drier and tremulous, tremor of the hands increases, the slight wandering passes into muttering delirium, and perhaps unexpectedly, about the tenth or twentieth day or earlier, the delirium lapses into coma, or the exacerbation terminates with extreme collapse and death."

Remittent fever becoming continued.—Increase in the length of the exacerbation, and decrease in that of the remission, is occasionally observed, until at length the fever is continued. In these cases there is always a tendency for the fever to become adynamic, as evidenced by a dry tongue, a frequent and feeble pulse, tremulousness of the hands, subsultus tendinum, &c. When the adynamia is very great, hæmorrhages from the nose, mouth, and mucous surfaces generally are not unfrequently observed.

Complications of Remittent Fever.

Cerebral complication.—The complication of remittent fever with head symptoms is very common and serious.

When delirium comes on early, and is accompanied by flushing of the face, suffused eyes, vomiting, and a frequent and more or less hard pulse, it may be related to determination of blood to, or inflammation of, the brain or its membranes. Too much significance must not however, in asthenic persons, be attached to the state of the pulse, since in them it is sometimes deficient in power, notwithstanding that determination or inflammation may exist.

The symptoms just noticed often pass into drowsiness, coma, and death. Dr. Morehead states that, in fevers of a bad type, delirium, with a tendency to drowsiness, and associated with general collapse, and dependent upon enfeebled nervous energy, is apt to come on at the close of a paroxysm early in the attack.

When delirium comes on at a later period, about the eighth or tenth day, or earlier in asthenic persons, and is low and muttering, with tremors of the hands, muscular twitchings, a frequent but small and feeble pulse, and a tremulous and dry tongue, it does not afford any evidence of inflammation or excess of blood in the brain, but is rather due to depression or failure of the function of the brain, in common with other vital actions.

Pulmonary symptoms.—Bronchitis and pneumonia are common accompaniments of remittent fever in natives of India, although they are said not to be so in Europeans. Pneumonia is often latent, and would be overlooked, but for the physical signs of its presence. Whether in asthenic natives the co-existence of pneumonia in this form materially influences the result of the fever, is I think doubtful.

Gastric symptoms.—Remittent fever is sometimes accompanied by urgent vomiting; the tongue is florid, and there is tenderness at the epigastrium. These symptoms are probably due to gastric inflammation, and must be distinguished from mere irritability of the stomach, which is common in simple uncomplicated remittent fever. The persistence of the vomiting, the florid tongue, tenderness at the epigastrium, and a pinched expression of face, will in general be sufficient.

Jaundice.—Jaundice, and not unfrequently pain and tenderness beneath the margins of the right false ribs, are often observed in remittent fever. Dr. Morehead states, that jaundice was present in 7 out of 90 fatal cases of remittent fever in European Officers, and in 28 out of 114 selected cases in natives. Ten of the cases were fatal in which it occurred.

When jaundice occurs in remittent fever, it probably in many instances depends upon congestion. Whether or not malaria exercises some kind of poisonous influence upon the function of the hepatic cells, whereby their eliminating power is diminished or suspended, is a speculation which is in advance of the present state of pathology; nor has it yet been ascertained whether or not in remittent fever yellow atrophy is a frequent cause.

Dr. Morehead took much pains to ascertain the cause of the jaundice in the ten fatal cases which came under his observation. In six cases the lymphatic glands near the entrance of the common biliary duct into the duodenum were enlarged, but in only one was it judged that the swelling pressed upon the duct. In one case the hepatic and common ducts were obstructed by a lumbricus, and in two cases there was constriction of the cystic duct. There were traces of inflammation of the mucous membrane of the duodenum and stomach in six cases.

Pathology.—The morbid appearances in remittent fever must of course be very various. Should it, when uncomplicated, terminate fatally by exhaustion, there would probably be no morbid appearances. When complications exist, there will of course be found after death anatomical changes in the organ or organs which may have been affected, and as these most frequently are the intestinal canal, brain, lungs, liver, and spleen, we usually seek in those organs for the evidences of disease. The intestinal mucous membrane is often reddened, and sometimes softened, and these appearances may be localised or more or less general. Ulceration is I believe rare, unless dysentery has been present, and then it will generally be found in the large intestines. It is almost certain that ulceration of Peyer's patches, which is so common in typhoid, does not occur in remittent fever.

The membranes of the brain, and the brain itself, are sometimes found to be congested, and the products of inflammation are occasionally met with. The lungs are often congested and hepatised. The liver and spleen are very generally enlarged from accumulation of blood, but seldom present the appearances of inflammation.

Bowel affections.—When remittent fever occurs in places where the temperature is moist and liable to considerable changes, dysentery is not an uncommon complication, but under other circumstances it is rare. Diarrhœa is said to be more common; but unless the occasional occurrence of typhoid fever in tropical countries is kept in mind, its frequency as a complication of remittent fever is apt to be over estimated. In 114 cases of remittent fever in natives, Dr. Morehead observed diarrhœa in six cases only.

Hepatic and spleen affections.—The liver and spleen are often enlarged from congestion in the early stage, but inflammation of these organs is very rare.

Head affection.—Cerebral complication, as already mentioned, may be due to inflammation, when, of course, the appearances of inflammation having existed, will be found in the brain or its membranes. But when the symptoms come on in the advanced stages of the disease, they are not inflammatory, and then, the only morbid appearance may be serum in the cavity of the cranium, and this is probably unconnected with them. Gastric complication is in sthenic persons often observed along with head symptoms, and then the vomiting is functional, but in asthenic persons it depends in many instances upon subacute gastritis.

The pathology of simple uncomplicated remittent fever has reference to the presence of a poison (malaria) in the blood. What the nature of this poison may be, or what its mode of action is, we do not know with certainty. There is good reason to believe that it is gaseous, and we may perhaps assume that it exerts its influence primarily upon the blood, and secondarily upon the nervous system. The varying effects of this poison in producing a severe or mild form of the disease, are doubtless in part traceable to its quantity and intensity, but probably in a greater degree to the susceptibility of the individual, and pre-existing disease of important organs, as of the heart, liver, or kidneys.

Causes.—Remittent has the same cause as intermittent fever, viz. malaria, and generally occurs when the poison is highly concentrated, or the individual in an unusual degree susceptible of its action.

Treatment.—The principles of treatment in remittent are similar to those in intermittent fever: we must endeavour to carry the patient safely through the exacerbation, and if possible prevent its recurrence.

Treatment of the paroxysm.—The measures to be adopted in the hot stage of intermittent are equally applicable to remittent fever; but as in the latter there is more danger of determination of blood to important organs, more active treatment is sometimes necessary. In very robust persons, at the commencement of the paroxysm, should the pulse be full and firm, and there is determination to an important organ, general blood-letting may be required, but this is rare; the application of leeches to any part to which there may be undue determination, will in general be sufficient. In asthenic persons, and even in those who are sthenic—when malarious influence has depressed the action of the heart—the utmost caution must be observed in abstracting blood. In sthenic persons, when the tongue is much furred, an emetic may be given at the commencement of the attack, and afterwards, should the tongue continue furred, and the abdomen be tumid, ten grains of calomel in combination with two grains of ipecacuanha; and this should be followed in from four to six hours by a purgative.

It is only within the first day or two that the calomel and purgative are likely to be useful, and in persons who are at all asthenic, or where the tongue is florid, and the stomach irritable, they should be withheld.

In those cases of remittent fever which have been called *inflammatory*, blood will require to be drawn either generally or locally, and cold applications used to the head, and even the cold affusion employed when the skin is dry and hot. Blood should be drawn at the height and not towards the close of the exacerbation, and much caution is requisite in determining the extent to which it should be carried. The guide is the state of the pulse and skin: should the *former* become soft and the *latter* coldish, it must be at once discontinued. As these cases are often attended by irritability of stomach, calomel must be given with much caution or not at all. In most cases leeches should be applied to the epigastrium, and afterwards a sinapism, and if there is much vomiting, effervescing draughts may be given.

After the measures just stated have been adopted, Dr. Morehead advises us to give on the succeeding night—should the pulse be soft, the abdomen supple, and the tongue moist—blue pill or calomel, in combination with a grain of ipecacuanha and one of morphia, but he does not think that the morphia is necessary in asthenic cases.

The first remission must be taken advantage of to administer quinine, which should be prescribed in doses proportioned to the severity of the attack. In general, from five to eight grains repeated every second or third hour for three or four doses will be sufficient. It is probable that the paroxysm may not be altogether prevented; but in most instances it will be postponed to a later part of the day, and lessened in severity. Upon its occurrence the quinine is to be omitted, but it should be repeated on the following day in the same or larger doses.

If the bowels are constipated, from one to two drachms of sulphate of magnesia may be combined with each dose of the quinine; or if, on the other hand, they should be relaxed, from five to ten minims of tincture of opium may be substituted. The diet should be carefully attended to: milk in small quantities should be given every two or three hours, and sago and arrowroot several times in the day or night. Chicken broth may also be administered if the patient can be induced to take it. In cases of simple remittent fever, treated as just described, convalescence may be expected in from eight to ten days, and inasmuch as the strength has not been unnecessarily reduced, it will not be prolonged.

In *congestive remittent fever* stimulants are usually necessary, until re-action has fairly come on. The further treatment is the same as that above described for simple remittent, with this reservation, that as the symptoms are apt to become adynamic, more stimulants and support will be requisite. When the secretions of the liver and intestines are suppressed, calomel may be combined with the quinine that is given during the remission.

In those cases of fever in which the remissions are very imperfect or absent, the treatment is similar to that which will be explained under typhus. We should, however, take advantage of the most imperfect remission for the administration of quinine, and carefully watch its effects. In all severe cases of remittent fever, and especially in those where there is a failing pulse, the patient should be carefully watched towards the close of a paroxysm, and the first sign of approaching death by syncope or asthenia met by the free use of stimulants. As regards local complications, they must for the most part be treated on general principles, with this understanding, that depletion is not so well borne as in primary inflammations, and that whatever measures are adopted, should not be such as will interfere with the use of antiperiodic remedies.

Head symptoms.—When head symptoms, as delirium, flushed face, &c. occur in a sthenic person whose pulse is full and firm, and skin hot and dry, general and local bleeding are indicated in the earlier exacerbations. The head should be shaved and cold applied; the bowels freely acted upon by a mercurial purgative, and small doses of tartar emetic administered if the stomach should not be irritable. It is, however, only in Europeans newly arrived in India that this mode of treatment is requisite or proper. In most cases, even in the early stage, we must be satisfied with applying a few leeches to the temples, cold to the head, and guarding the patient against all sources of excitement. When delirium is low and muttering, with a tendency to drowsiness, the pulse being small and easily compressible—no matter what the constitution of the patient may be—depleting measures are no longer indicated, and if employed would do harm. A blister may in such cases be applied to the nucha with advantage, and the remission should be selected as the most suitable time for its application. Sometimes the head symptoms arise from inflammation of the brain, but this is rare. Should such inflammation be diagnosed, it must be treated upon the same principles as primary meningitis, due regard being however had to the modifying influence of the fever. Dr. Morehead states that the head symptoms from meningitis are characterised by "milder delirium, by less febrile reaction, by greater persistence of the symptoms during the remission, by agitated movements of the hands and fingers, and occasional convulsions; and are most likely to occur in the less sthenic states of constitution." Head symptoms, coming on in the advanced stages of remittent fever, in no way offer any bar to the free use of stimulants; but in such cases it is well to apply a blister to the nucha, or to blister the scalp. It should be clearly kept in mind that the existence of head symptoms, whatever may be the cause of them, in no way contra-indicates the use of quinine during the remission.

When there is gastric complication in remittent fever, leeches, sinapisms, and blisters must be used to the epigastrium, cold drinks in small quantity frequently taken, and small pieces of ice swallowed.

In remittent fever complicated with jaundice no special treatment is in general required; the yellowness of the skin will disappear as the fever is checked. But when with jaundice there is tenderness beneath the ribs, leeches and small blisters should be applied there, and during the remission blue pill or other eliminants may be combined with the quinine. The use of opium in remittent fever is a matter of much importance. The following principles are stated by Dr. Morehead:—

1. "Opium can be used with safety only in the restlessness of the early stage of remittent fever, when there are no symptoms of marked determination to the brain, and

when the pulse is of good volume and soft, and not much above 100.

2. "When remittent fever has persisted for six or seven days, each recurring exacerbation is attended with increasing frequency and decreasing strength of the pulse. This depression of the heart's action is most observable towards the close of the paroxysm, and is not unfrequently attended with general restlessness, and then the temptation to give an opiate is often great, in the hope that sleep and its consequent advantages may be secured; but under these circumstances, the proceeding is always dangerous. A pulse that ranges towards 120, or one not so frequent, but feeble and compressible; or still more, a pulse that has the frequency of 120, and is at the same time feeble and compressible, are conditions which may be held to contra-indicate the use of a full opiate; even though they should not be associated with headache, wandering, delirium, or tendency to drowsiness. Nor is it difficult to understand why this should be. These conditions of the pulse indicate that the tendency to death is by syncope—a tendency sure to be most marked towards the close of the paroxysm, and to increase with each returning exacerbation of fever. In this depressed state of the heart's action, the functions of the brain also become impaired, and under the influence of a full opiate, are not unlikely to be suspended; in other words, the opium is apt to induce coma, and its sedative influence on the brain, acting through the nervous system, still further depresses the action of the heart; and thus, under these circumstances, an opiate injudiciously given, favours death both in the way of syncope and coma.

3. "As yet no derangement of the brain itself has been assumed. But in a great proportion of cases of remittent fever, of six or seven days' duration, the earlier exacerbation are marked by flushing and headache, the later ones by slight wandering or tendency to drowsiness. This condition of the cerebral functions, *whatever the state of the pulse may be*, contra-indicates the use of opium; for in such cases the tendency to death is by coma. If the opiate be given at the close of the earlier paroxysms, it may only increase the restlessness; but if it be given at the close of the later paroxysms, when wandering

or tendency to drowsiness is present, it will most surely expedite the supervention of coma, and ought to be most scrupulously abstained from.

4. "But in those cases of remittent fever in which the wandering delirium or drowsiness of the later paroxysms shows a tendency to death by coma, there is also, most generally speaking, a frequent and failing pulse."

"Whenever an exacerbation of remittent fever, which has been attended with wandering delirium or a tendency to drowsiness, terminates with a quick and feeble pulse, it may be inferred with tolerable certainty, that death by coma is not far distant, is only to be warded off by the most judicous management, and is most certain to be hurried on if we commit the grievous error of attempting to lessen the delirium and restlessness by the exhibition of opium. To conclude then, whenever in remittent fever the pulse is towards 120, feeble and compressible, and whenever there is wandering delirium or slight drowsiness, the exhibition of a full opiate is a measure of danger, more particularly towards the close of a febrile exacerbation. In other words, whenever in remittent fever the tendency to death by asthenia or by coma is well marked,* a full opiate will expedite the fatal result."

CONTAGIOUS FEVERS.

Certain fevers are known to be produced by emanations from the bodies of persons who are suffering from fever of the same kind, and are hence called contagious or infectious; typhus, typhoid, relapsing fever, small pox, measles, scarlet fever, are familiar examples.

TYPHUS FEVER.—Typhus fever is the source of great mortality in the crowded cities of temperate climates, but it does not occur in the tropics, and on this account will be very briefly described.

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* "I need hardly observe, that in these remarks I refer exclusively to opiates given with the intention of, and in doses calculated to produce the soporific action of the drug. Whether opiates given in small doses, with a view to their stimulant effects, may or may not be admissible in some of the states of fever adverted to by me, is a question altogether apart from my present subject, and one in regard to which I am unable to express any opinion from experience."

Symptoms.—After the poison of typhus has been received into the system, the patient begins to feel out of health; he is weary without apparent cause; has pain in the back and limbs; loses his appetite, and has restless nights. This state may last for several days, but is generally of short duration; at length he begins to feel chilly, and has not unfrequently nausea and vomiting. The cold stage may vary from a few minutes to several hours, when febrile heat, and other febrile symptoms set in. At first the fever does not differ from other fevers, except that there is unusual prostration; the pulse is very easily compressible, and the expression of the face (which is of a dusky hue, with blood-shot eyes) is dull and apathetic. There is severe headache, and the mind is sluggish or even confused. The febrile symptoms slowly increase: the skin becomes pungently hot, the pulse very frequent, rising sometimes to 150 or 160, and the tongue dry; the bowels are in general constipated, but the abdomen is not tympanitic. The nights are sleepless, and severe aching pain is felt in the limbs; about the fifth day of the fever, or between it and the eighth, an eruption of dark coloured spots resembling that of measles appears on the skin. The spots are slightly raised, and disappear for a moment on being pressed. They may be few or numerous, and of large or small size, according as they have or have not coalesced. They are often very minute. Their most common seat is on the chest, abdomen, and lower extremities. When once the spots have come out, they remain until the end of the attack. Mixed with these spots there are often petechiæ or spots of sudamina. As the disease makes progress, the tongue becomes brown, and the dryness increases; sordes collect about the teeth, gums, and lips; the patient lies in a drowsy state, muttering incoherently, but he may often be roused, so as to answer questions; there is extreme prostration and a sense of faintness on the slightest exertion. In a still more advanced stage, the tongue becomes almost black, and the sordes are sometimes sanious; the face is pinched and sunken. The patient lies on his back and can scarcely be roused. The eyes are half closed and the mouth is open. He constantly slips down in the bed. There is picking at the bed clothes, and there may muscular twitchings (*subsultus tendinun*). The stools and urine are passed involuntarily, or there may be retention of urine; the respiration becomes slower and slower, and at length the patient sinks and dies. In favourable cases, the frequency of the pulse is diminished, the skin becomes cool, and the tongue moist; the eruption fades, and consciousness is restored, and at length there is slow convalescence. In some cases amendment is preceded or accompanied by profuse discharge, as from the skin or kidney, which is considered to be critical. The duration of typhus fever is extremely variable. Patients sometimes die within 24 hours, or not for many days or even two or three weeks—the most frequent period of death is between the twelfth and twentieth days. In mild cases recovery commences in a few days; in severe cases, not until twenty or thirty days have elapsed. In ordinary cases, which terminate favourably, the end of the third week may be stated as the usual period of convalescence.

Pathology.—Typhus fever is quite unconnected with any local disease; in fatal cases the several organs may be unchanged. When organic changes *are* observed, they result from local inflammations which have arisen subsequently to the fever—and as there are few organs which may not be secondarily inflamed, the morbid appearances are very various. It may be mentioned, that although there are sometimes evidences of inflammation, or even of ulceration in the intestinal mucous membrane, disease of Peyer's glands is rarely or never seen. The blood is always altered, as may be ascertained before as well as after death—it is of a dark colour, and coagulates very slowly into a soft clot; the fibrin is in less than the usual proportion.

Causes.—The poison which produces typhus fever is generated when persons are crowded together in ill-ventilated buildings, are badly fed, and exposed to emanations from decomposing organic matters. The disease once produced, is capable of being conveyed to a healthy person, by emanations from the body of the person diseased. The immunity of persons living in tropical countries from the ravages of typhus fever, does not in the present state of our knowledge admit of explanation.

Treatment.—At the commencement of an attack of typhus, an emetic is said to be of service; and in the cold stage, should reaction be long deferred, stimulants are requisite. When febrile heat is established, little should be done at first beyond sponging the skin with tepid water, and administering an occasional cathartic should the bowels be constipated. Cold may be applied to the head, and even a few leeches should the headache be very severe. To relieve the sensation of heat and dryness, the solution of acetate of ammonia may be given. So soon as symptoms of depression show themselves, stimulants and as much nutritious food as can be taken are to be prescribed. The brandy mixture of the pharmacopœia, or arrack or brandy, may be given in small quantities every hour or two, or even more often in bad cases, along with milk and chicken broth; and small doses of quinine are often useful. When there is much irritability and sleeplessness an opiate is of service.

TYPHOID FEVER. *Enteric fever. Pythogenic fever.*—By typhoid is understood a form of fever in some respects allied to typhus, but which differs from it in many of its symptoms, and chiefly in being nearly always associated with disease of Peyer's glands. Until within the last few years, typhoid fever was not recognised in tropical countries. It is now known to prevail, but in a less degree, than in temperate climates.

Although the term typhoid is applied to this fever, it must be distinctly understood, that it is by no means always attended with typhoid or adynamic symptoms.

Symptoms.—Typhoid fever sets in very slowly and insidiously, and sometimes the symptoms are so gradually developed, that the time of its commencement can scarcely be fixed. The earliest symptoms are lassitude, impaired appetite, restlessness, slight headache, rather frequent pulse, occasional epistaxis, weariness, and pains of the limbs, chilliness, and flushes of heat. The bowels are often loose, and when not loose, are easily acted upon by purgative medicine; sometimes, indeed, diarrhœa is the most marked symptom, and the patient is often supposed to be suffering from bowel complaint. These symptoms may gradually increase for a week or more, without the patient being so ill as to be obliged to desist from his usual occupation.

At length—generally at the end of the first week—he takes to his bed. There are now the usual symptoms of fever, as heat of skin, frequent pulse, loss of appetite, &c.; but there are peculiarities which should be carefully noticed. The expression of the face in slight cases may be but little changed, but in general it is indicative of languor and sadness. The cheeks are flushed, especially towards evening or after food is taken, but sometimes the face is unusually pale. The pulse is between 100 and 120, but is liable to vary much in the same patient, being at one time not more than 90, and at another as much as 120; it is in general more frequent in the evening than in the morning. The skin, though warm, is at times moist, and occasionally there is sweating, and this is most observed in the morning, when, in mild cases, there is a remission of all the febrile symptoms. The lips are parched and dry; there is much headache and pain in the back and limbs, but the mind is clear; the tongue is covered with a thin fur in the middle, and florid at the tip and edges. But the most notable symptoms have reference to the abdomen: the bowels are in general loose, there being from four to six watery evacuations in the twenty-four hours, of a yellow colour, and not unlike pea soup in appearance;* the abdomen is swollen from tympanites, and on making pressure in the right iliac region, gurgling is often perceived, and the patient shrinks and complains of pain. Between the seventh and fourteenth days, an eruption appears on the abdomen, chest, and back, and sometimes extends to the extremities. It consists of spots from half a line to two lines in diameter, of a rose colour, isolated, and circular, and slightly elevated above the skin. They are never acuminated or pointed, nor indurated. When pressed upon they disappear, but return so soon as the pressure is removed. They come out in successive crops, each crop being said to last from three to five days. The eruption is seldom copious, and in most cases there are not more than thirty or forty spots. Its duration depends upon the length of the fever, and may be stated to vary from seven to twenty-one days. The eruption is liable to be overlooked when the spots are few in number; but it is not present in all cases of typhoid fever. According to some very good observers, it is absent in 20 per cent. of the cases.* Mixed with the rose-coloured spots, sudamina are sometimes seen about the third or fourth week.

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* The odour of the evacuations is offensive and ammoniacal, and their reaction alkaline. Sometimes they contain blood.

As the disease makes progress, the patient is observed to lie for the most part upon his back, his face is somewhat dull in expression, and the pupils of the eye are dilated. He seldom speaks to those about him, and is at times delirious, and sometimes violently so; but answers questions, though not always intelligibly or coherently. He does not ask for food, but readily takes such fluid food as may be given to him. The pulse is seldom under 120, and is weak; the lips are dry and parched, and the pupils dilated. The tongue is florid, dry, and glazed and fissured, or brown and dry; but in cases which are not very severe, it often continues to be moist; sordes collect about the lips, gums, and teeth; the spleen is enlarged, the abdomen is more distended, and the looseness of the bowels continues. In some cases hæmorrhage from the intestines occurs, and occasionally in such quantity as to cause death. It may be due to determination of blood to the mucous membrane, to some alteration in the blood itself, or to a vessel having been opened by an intestinal ulcer. Cough from intercurrent bronchitis is a very common symptom.

At a still later period the delirium becomes low and muttering, the pulse feeble and very rapid, and the face heavy and stupid in expression; the delirium passes into stupor, followed by coma and death, or by gradual recovery.

It must not be supposed that in all cases the symptoms last described are present. In many instances the tongue continues moist throughout the attack, and delirium is absent. Dr. Murchison, who has paid unusual attention to this disease, and to whose elaborate work I am much indebted, states that "there is no disease in fact which exhibits a more protean character, from the predominance of certain symptoms, and from the presence of complications. Some cases run a mild course, so that the patient is scarcely confined to bed, some are at first severe, and afterwards put on a mild character; others, at first mild, undergo a sudden aggravation; while others are severe from first to last; occasionally acute delirium is observed almost from the commencement, while in many cases there are no cerebral symptoms throughout the disease. Vomiting may be a distressing symptom, and diarrhœa may be profuse and constant; or on the other hand, there may be no symptoms of gastric derangement, and the bowels may be constipated from the beginning to the end." In slight cases the symptoms begin to subside from the seventh to the fourteenth day, but in more severe attacks not until between the twentieth and thirtieth days, or even later. The convalescence is often prolonged and reduction in the frequency of the pulse is very gradual. Relapses often occur, but the duration of second is usually shorter than that of first attacks.

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* I have rarely seen the eruption of typhoid fever in Natives of Bombay, but I am unwilling to attach much weight to this, because my opportunities of watching cases of this disease throughout their whole course have been few.

Of the complications of typhoid fever, diarrhœa, bronchitis, and peritonitis are the most common; but many others have been observed. Jaundice has been very rarely noticed. Peritonitis is most frequently caused by perforation of the intestine, but may occur at an early period, from extension of inflammation from the mucous to the serous coat.

Perforation of the ileum is of all complications the most serious in typhoid fever. It may occur as early as the eighth or ninth day, but very generally it does not happen until between the thirtieth and fortieth days, or even later. It is a remarkable fact, that the probability of perforation is not in proportion to the severity of the abdominal symptoms. It has been observed often when the bowels had been but little relaxed, the patient being able to follow his occupation up to the time when the perforation occurred.

The symptoms of perforation are sudden collapse with vomiting and diarrhœa, a rapid, thready, or imperceptible pulse, thoracic breathing, pale pinched face, afterwards cold extremities, great prostration, profuse sweats, and death.

Recovery after perforation is extremely rare.

Varieties.—Typhoid fever may exist in a mild or severe form: in the *former* there are slight febrile symptoms, with or without diarrhœa, disturbed sleep, and a rose-coloured eruption; in the *latter* the symptoms vary according as derangements of certain functions predominate. Dr. Murchison calls attention to the *insidious* or latent form, which he describes as follows :—

> "There may be no great acceleration of the pulse, and the characters may be so indefinite, that the nature of the case is not diagnosed. In one class of cases, the chief symptoms are irregular chills, alternating with heat and flushing, slight headache, loss of appetite, lassitude and disturbed sleep : diarrhœa may be absent, or the bowels may be constipated. In another class of cases, the patient suffers chiefly from catarrh, and he is thought to have merely 'taken a cold.' In a third class, the chief symptoms are nausea, vomiting, and a red tongue, and the patient is thought to be suffering from gastric derangement, or from slight 'gastric fever.' The above symptoms continue for two weeks or longer, but are so mild, that no anxiety is felt about the patient, when suddenly he becomes alarmingly ill; profuse hæmorrhage from the bowels takes place, which may induce fatal syncope; or, more commonly, symptoms of peritonitis from perforation set in, and after a few hours terminate in death."

Pathology.—In fatal cases the large intestines are usually found to be filled with flatus, whilst the small ones are collapsed. The seat of local disease is for the most part in the ileum, and almost confined to Peyer's and the solitary glands. Their appearance varies according to the stage of the disease at which death may have occurred. If in the early stage, they are simply enlarged from morbid deposits. At a later period (eighth or tenth day) they are indurated and elevated above the level of the membrane, and at a still later period ulcerated. Along with these changes, the mucous membrane in the neighbourhood is often of a pink hue, and the peritoneal covering of the intestine, corresponding to the enlarged glands, of a bright red colour. The enlargement depends upon deposit in the interior of the gland, and sometimes the glands burst, and discharge their contents into the submucous tissue, in which case ulceration always follows. So long as the deposit is limited to the glands, it may be removed by absorption. Ulceration, which usually commences about the ninth or tenth day, may occur by abrasions of the mucous membrane, which run together and extend in depth and form ulcers, or the whole of the gland and its contained matter may separate in the form of a slough. The latter is believed to be the most common mode of formation. Sometimes the sloughs are observed loosely attached to the surface of the ulcers.

The ulcers, which are confined to the lower third of the small intestine, are elliptical, circular, or irregular in shape, and vary in diameter from a line to an inch and a half. The elliptical ulcers always correspond to the attachment of the mesentery, and their long diameter is *longitudinal,* in this respect differing from the elliptical ulcers met with in phthisis, the long diameter of which is transverse. The edges and base of the ulcers are not thickened. In some cases the cicatrices of ulcers are observed.*

The depth of the ulcer of course varies, and sometims extends through the whole of the coats, causing *perforation*. Perforation of the peritoneal covering may be due to molecular disintegration, in which case there may be one or more apertures of small size, not more than large enough to admit a pin or probe, or it may be caused by sloughing, when of course there is one larger opening.

The appearances just described are believed to be peculiar to typhoid fever. The ulcers differ from the tubercular ulcer in not being cup shaped, and in the edges not being thickened. The enlargement of Peyer's glands, sometimes met with in other diseases, is in general slight, and seldom, except in phthisis, ends in ulceration. Whether Peyer's glands are ever ulcerated in malarious fever, requires further investigation.

The spleen and mesenteric glands are always enlarged, and sometimes the solitary glands of the large intestines are ulcerated. The bronchi are often filled with frothy mucous. Other morbid appearances are sometimes observed, depending upon various local complications that may have been present.

Causes.—There has been much discussion as to whether typhoid fever is contagious or not. It must I think be admitted, that facts are recorded, which admit of no other explanation than that it may be conveyed by emanations from the body of a person suffering from the disease. At the same time it seems certain that it cannot be propagated by fomites—that is, the poisonous matter, whatever it may be, does not attach itself to the clothes or bedding of the patient. There is much ground for the belief, that the alvine discharges are the medium through which the disease is sometimes communicated. But although the occasional propagation of typhoid fever by infection cannot be denied, by far the greater number of cases are caused by emanations from drains and cess-pools, or by drinking water which has been contaminated by admixture with them. Age seems to afford a predisposition to typhoid fever, young persons being much more liable to be attacked than those who are advanced in life. The cases that have fallen under my observation in Bombay have chiefly been in boys and girls.

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* Cicatrization usually commences about the end of the third week, and may be completed by the end of the fifth, or even a little sooner.

Diagnosis.—The diagnosis of typhoid fever is of importance, and especially in tropical countries, where its existence has been doubted, or even denied. In a typical case there would be no difficulty: the slow and insidious commencement, the state of the abdomen, and the rose-coloured eruption, would be quite sufficient to distinguish typhoid from other fevers, but there are many cases in which there is no eruption, and some in which abdominal symptoms have little prominence. It may be stated with confidence, that there is no one symptom, the absence of which in itself invalidates the existence of typhoid fever. The diagnosis rests upon a consideration of the symptoms as a whole, on the mode of commencement, the progress and duration of the attack, and the long convalescence. Much weight should be given to the attitude and expression of the patient, and the state of the mind, &c. The decubitus on the back, the dull and apathetic expression of face, the unwillingness to engage in conversation, though questions are readily answered, the dry parched lips, the occasional delirium, the deafness, are taken together, very characteristic of the disease, and when the attack is slow and obscure at its commencement, has resisted quinine in full doses, and has a duration of from twenty-five to thirty days, very little doubt need remain of the disease being typhoid fever, notwithstanding that the eruption is absent, and the abdominal complication little marked. My own belief however is, that with the symptoms just stated, the abdomen is generally tympanitic, and the bowels, if not loose, are acted upon far too readily by even the mildest aperient.

The mode of commencement of the attack is certainly different from that of the malarious fevers. From the first sign of deranged health, many days often elapse before the febrile symptoms are developed. In remittent fever on the contrary, the attack is often sudden, and the symptoms well marked within a few hours; and in like manner these fevers are equally dissimilar as regards their duration and the period of convalescense. Remittent fever, lasting for twenty-five or thirty days, has been in my experience an unusual occurrence, and when thus prolonged, recovery very rarely observed.

As regards the morbid anatomy of typhoid fever, it is of much interest to determine the importance that should be attached to ulceration of Peyer's glands. It is well ascertained, that the amount of ulceration and the febrile symptoms are in no way related. In the worst cases, when death takes place at an early period, the evidence of glandular disease is very slight. But the question of most importance to be determined is the weight that should be given to such ulceration as a positive or exclusive sign. Some writers appear to view it, when febrile symptoms have been present, as absolute proof of the previous existence of typhoid fever, and in many of the cases recorded, as having occurred in India, the diagnosis has been founded upon this morbid appearance. Others again believe it be to a common pathological change. Dr. Morehead states,* that turgescence or ulceration of Peyer's glands occurs in cholera, in protracted diarrhœa, in acute muco-enteritis, as an occasional complication of remittent fever, and a frequent one of phthisis pulmonalis. Putting out of consideration phthisis and dysentery, my belief is, that Peyer's glands are seldom ulcerated in the diseases of tropical countries. Comparatively few cases are recorded, and in my own experience I have rarely observed it, except in connection with the diseases just mentioned. This observation, if true, is calculated to negative the frequent occurrence of intestinal complication in remittent fever, as from the mortality and frequency of this form of fever in India, ulceration of Peyer's glands should be a common, in place of being a rare, phenomenon. It is true, that from time to time cases of so-called remittent fever are recorded, in which glandular ulceration is noticed. Some of these cases, however, more nearly resemble typhoid than remittent fever. But whilst I am quite satisfied that Peyer's glands are rarely ulcerated in malarious fevers, I am not preparto assert that they never are. Further investigation upon this point would seem to be required, and in the meantime, the existtence of such ulceration in connection with fever, should lead to a very careful inquiry into the symptoms, mode of invasion, and progress of the disease during life. The rarity of enteric ulceration in tropical fevers, tends to show that if typhoid fever does exist, it is either an uncommon, or at all events not a frequently fatal disease; at the same time it must not be overlooked, that fatal cases of typhoid fever are met with in which, should death have taken place in the early stage, the glands may not present any appearance of ulceration, and but little of turgescence.

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* Researches on Disease in India, page 161.

From typhus, typhoid fever may be distinguished by the character of the eruption; but should there be no eruption, the distinction becomes difficult—the greater prominence of abdominal symptoms, the flushed and not dusky appearance of the face, the appearance of the tongue, and the duration of the attack, will enable an approximative opinion to be formed.

There is occasionally great difficulty in distinguishing between typhoid fever and tubercular meningitis. According to Dr. Murchison, the following are the points most to be relied upon when the eruption is absent:—"In tubercular meningitis, the vomiting at the outset is usually more urgent, the tongue is rarely dry and brown, as it is in most cases of fever with severe cerebral symptoms; the bowels are usually constipated, or if there be diarrhœa, the stools are not ochre-yellow, as in fever; the abdomen is usually depressed and painless, instead of being tender and tympanitic; enlargement of the spleen, intestinal hæmorrhage, and epistaxis, often observed in fever, are not met with in meningitis. The headache is more severe than in fever; partial paralysis points to meningitis rather than to fever; and lastly the patient is more irritable, is more intolerant of light and sound, and offers greater resistance to any examination in meningitis than in fever."

From acute phthisis typhoid fever is known by the abdomen being depressed, and by the history of the patient and of the attack. In children it is often difficult to distinguish typhoid fever from gastro-enteritis, and in the absence of the eruption this may be impossible.

Prognosis.—The mortality from typhoid fever appears to be about 1 in 5, or about 18 per cent., and somewhat, but not in a great degree, less in young persons. It may be stated generally to be proportioned to the severity of the cerebral symptoms and their early appearance, and also to the degree of prostration. Amongst the symptoms which may be viewed in a greater or less degree as of unfavourable import, are despondency, and especially a presentiment of death on the part of the patient; a pulse above 120, and which at the same time is very soft and compressible, and still more, complete absence of the cardiac impulse and systolic sound, or on the other hand, an excited, thumping action of the heart, with a feeble radial pulse; sleeplessness, contracted pupil, muscular twitchings, hiccup, rigidity of muscles, and strabismus; vomiting coming on suddenly after the fourteenth day, hæmorrhage from the bowels, &c.

Treatment.—Unlike the malarious fevers, there is no specific remedy for typhoid fever. It must therefore be treated upon certain general principles. As it may be supposed that there is some kind of poison in the blood, we should endeavour to neutralise it, bring about its elimination, and remedy the altered state of blood induced by it. It is also necessary to endeavour to eliminate the products of the metamorphosis of tissue. Other indications are to reduce the temperature, sustain vital power, and ward off or remove complications. The mineral acids, as the hydrochloric and sulphuric, may be given at intervals of four or six hours, and the patient's drink acidulated with phosphoric acid. In the early stage, if there are remissions, quinine should be combined with the acid in doses of from two to six grains. If diarrhœa is urgent, four or five minims of tincture of opium may be given with each dose; but if on the other hand the bowels should become constipated, a simple enema or the mildest laxatives must be administered. Should diarrhœa continue to be unchecked, an enema of starch, containing from twenty to thirty minims of tincture of opium, often gives relief. Should these means fail, astringents are indicated, as gallic acid, acetate of lead, &c. and they may be given in combination with

Dover's powder or morphia, if there is not severe pulmonary or cerebral complication, as indicated by stupor or marked contraction of the pupil.

The skin should be frequently sponged with tepid water, and cold may be applied to the head. Secretion from the kidney is to be promoted by administering nitric ether and other diuretics. The vital powers are to be sustained by fluid food, as milk, arrowroot, mutton and chicken broth, and beef tea for those who do not object to use it. The abdomen should be fomented, and turpentine stupes often give much relief.

When there is hæmorrhage from the bowels, astringents are indicated. Dr. Murchison places much reliance on sulphuric acid and opium. Turpentine, in doses of 15 to 20 or 30 minims every hour is often successful, as is also acetate of lead with opium.

Vomiting before the tenth day of the disease is said to be often checked by an emetic; after that time, or before, should emetics fail, a sinapism is to be applied to the epigastrium, the acids omitted, and soda or bismuth and hydrocyanic acid administered. For the relief of the tympanites, an assafœtida enema may be tried, or small doses of turpentine.

Sleeplessness, which is sometimes a very urgent and dangerous symptom, must be treated according to the stage of the fever at which it occurs. In the early stage, when accompanied by headache, it may be sufficient to apply cold to the scalp, and use the cold affusion; and in robust persons a few leeches may be applied to each temple; should these means fail, or the sleeplessness be at a later period, opiates are to be given, provided that they are not contra-indicated by the circumstances already stated. Delirium in the early stage, when the pulse is of good strength, requires that the head should be shaved and cold assiduously applied. Should these fail, opium is recommended in combination with antimony. At a later period, when the pulse is feeble, opium and stimulants are indicated. In protracted cases, care should be taken to guard against rupture of the almost perforated intestine, by causing the patient to avoid all unnecessary movement. Should perforation take place, chief reliance must be placed on opium. During convalescence much care also is requisite. Purgative medicine should be avoided, and the diet carefully regulated.*

EFFECTS OF ELEVATED TEMPERATURE.

ARDENT CONTINUED FEVER.—Persons who have newly arrived in tropical countries, in the hot season of the year, often suffer from a form of continued fever, which seems to be essentially connected with elevated temperature. It seldom occurs in the native population, and old residents are also for the most part exempt.

Symptoms.—The attack is usually sudden; but sometimes more or less giddiness or faintness precedes it for ten or twelve hours. It is not ushered in by a distinct rigor, and even chilliness is not always present. The febrile state is characterised by pungent heat of skin, headache, and pains of the back and limbs; a flushed face, intolerance of light and sound, a coated or florid and sometimes dryish tongue; a frequent, full, and firm pulse; oppressed breathing; scanty and high-coloured urine. There is a feeling of oppression at the precordia, and more or less restlessness, and very generally vomiting of bilious matter; the bowels are often constipated, but may be loose and the dejections tinged with bile; sometimes the skin also is tinged yellow. Under suitable treatment the symptoms often subside, but should they not do so, delirium sets in, and one of two things happens: the patient becomes comatose and dies, or at the end of two or three days the febrile symptoms disappear, and he becomes collapsed—the skin is cold and clammy, and the pulse very feeble. From this condition recovery is rare. The most common complications are gastric derangement, jaundice, and cerebral determination. The duration of the fever is from two to four days.

Pathology.—The appearances found after death are redness, and sometimes lymph-effusions and dark-coloured spots on the mucous membrane of the stomach and intestines, and more rarely on the pleura and peritoneum. The liver and spleen are filled with dark-coloured blood, and the blood generally is fluid and of a dark colour. There is little doubt that this fever depends upon high temperature, the effect of which is often favoured by a plethoric state of the system. There is no reason to suppose that malaria is operative; at the same time it is quite possible that, in situations where malaria abounds, malarious fever may exist at the same time with the fever now under consideration.

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* Relapsing fever, being for the most part of local prevalence, and quite unknown in the tropics, is not considered.

Treatment.—At the commencement of the attack, general blood-letting is requisite, and afterwards leeches may be applied to the head. The skin should be sponged with cold water, and water may be poured over the head. The bowels should be freely acted upon by mercurial purgatives, and tartar emetic given when the stomach will bear it. Depletive treatment, as just described, is only applicable at the commencement of the attack, and would do harm if employed after the first two days, when collapse is to be apprehended. Should collapse come on, stimulants must be freely given.

SUN-STROKE.—*Coup-de-Soleil. Heat Apoplexy. Erethismus Tropicus, &c.*

The effects of high temperature in causing derangement of important functions—as of the brain, heart, and lungs—which not unfrequently results in death, has been observed not only in tropical countries, but also in temperate climates during the hot seasons of the year. Such derangement is not necessarily connected with the febrile state, and is for the most part suddenly produced.

Symptoms.—The symptoms vary as the tendency to death may be by syncope or coma, or by syncope and coma combined; and according to Dr. Morehead, whose description of them will be here chiefly followed, they may be arranged in three groups or classes, which constitute as many varieties of the disease.

1. After premonitory symptoms, of which a dry and hot skin, flushed face, headache, delirium, a full but easily compressible pulse, and a tendency to drowsiness are the chief, the patient becomes more or less comatose, the pupils are contracted, and the action of the heart is tumultuous; there are muscular twitchings, the breathing is hurried and oppressed, and the pulse small and compressible. Afterwards the coma becomes profound, and the pupils are dilated; the countenance is swollen and livid

the respiration sterterous, and the pulse very feeble, and the patient often dies in from two to nine hours from the commencement of the attack. It is remarkable that the heat of skin continues up to, and indeed remains for some time after, death. In favourable cases, and under proper management, the serious symptoms last noticed may be prevented, and the patient recover.

2. Without any warning, the individual suddenly falls to the ground in a state of insensibility, and dies in a few seconds. But more frequently there is not complete insensibility, but only drowsiness, from which he may be partially roused; there is a feeling of faintness, with giddiness and dimness of sight, and the pupils are dilated. When roused, he complains of constriction of the chest, with a sense of weight and oppression at the epigastrium. The respiration is sighing, and not unfrequently there is nausea and vomiting. The lips and face are pale, and the skin, except that of the head, is cold and clammy; the pulse is feeble and slow. Patients often recover from this state under proper treatment; but in less favourable cases the pulse loses strength, the respiration becomes more sighing and irregular, and death takes place in some cases preceded by convulsions.

3. After premonitory symptoms, not unlike those in the variety first noticed, and others indicating much depression of the heart's action, convulsions occur, followed by coma, lividity of the lips and nails, failing pulse, a skin sometimes hot but moist, at others cold and clammy, and death, partly by coma and partly by syncope.

The pulse varies much in the different forms: it is sometimes full, but more frequently small, and is rarely or never hard. The pupils are contracted in the stage of drowsiness, but become dilated as coma supervenes. In some cases they are said to have been alternately dilated and contracted. The premonitory delirium is sometimes violent, but more frequently subdued—some patients have been observed to smile and laugh, but if spoken to become excited and alarmed; others to weep when asked a question. In a few cases difficulty of deglutition has been noticed, attempts to swallow being followed by convulsions. Drowsiness is amongst the most common of the early symptoms, and loud moaning during coma has often been observed.

Very frequently there is no group of premonitory symptoms; but single symptoms have been recorded which are deserving of attention. Thus, frequent micturition has been observed, and Dr. Simpson, of H. M.'s 71st Regiment, found on inquiring, that every soldier siezed with "coup-de-soleil," who was capable of answering questions, had not perspired for a longer or shorter time; some not for days before the attack.

When by suitable treatment the attack has been quickly checked, recovery is rapid; but if the symptoms have been of considerable duration, much prostration, cerebral disturbance, and even paralysis may be left.

Pathology.—The pathology of this disease is very obscure, as may be inferred from the names by which it is designated. Dr. Morehead and others believe "that the phenomena of sun-stroke are produced by depressed function more or less complete, and varying in degree, of the cerebro-spinal and sympathetic nervous systems." When death is sudden or instantaneous, the function of the muscular fibre of the heart is believed to be suspended, and consciousness and respiration destroyed, much in the same way as by a blow or by cerebral hæmorrhage. In less degrees of syncope, the influence is thought to be primarily upon the ganglia of the sympathetic.

The post mortem appearances afford but little insight into the pathology of this affection. The brain and lungs are often congested, and the blood is always fluid. Perhaps sufficient weight has not hitherto been given to an increase in the temperature of the blood, as the immediate cause of the symptoms in some forms of sun-stroke. Dr. Morehead thinks that diminished evaporation from the skin may account for the blood being raised some degrees above the normal standard; and, indeed, it has often been noticed, that perspiration was almost suspended for some time before the attack. The almost immediate relief obtained from the cold affusion, whereby the heat of the whole body is lowered, would seem to support the doctrine of increased temperature. Nevertheless, in those cases of sunstroke where death is almost instantaneous, it is probable that a more direct effect is produced upon the nervous system than would be explained by a gradual heating of the blood.

Dr. Morehead thus briefly sums up the pathology of sun-stroke :—

"1. The cerebro-spinal form, commencing with cerebral symptoms, without much depression of the pulse in the first instance, characterised by pungent heat of skin, and proving fatal by coma, is due to increased heat of the blood disturbing and depressing the functions of the cerebro-spinal nervous system.

"2. The cardiac form, with small or imperceptible pulse, cold and clammy skin—often suddenly coming on and proving speedily fatal—is due to a direct depressing influence, probably on the entire nervous system, irrespective of the condition of the blood.

"3. In the mixed form there are varying proportions of both conditions, viz. over-heated blood and direct influence on the nervous system."

Causes.—It need scarcely be said, that the cause of sun-stroke is high temperature; at the same time it is certain, that fatigue and cachexia predispose to its influence. To one form (that first described) sthenic persons who have just arrived in the tropics are the most liable. It is not at all necessary that there should have been exposure to the direct rays of the sun. Many persons have been attacked in the early morning before the sun had risen, and many more in hospitals and barracks. There is reason to believe that a temperature of at least 90° F. is necessary to cause sun-stroke, and the effect of the heat is greatest when the air is moist and still; and it is also intensified when persons are without a sufficient supply of drinking water, as often happens to soldiers in the field.

It has also been observed, that fat muscular men are more liable than others to sun-stroke, probably because fat favors the accumulation of heat.

Treatment.—The effects of high temperature may often be prevented by avoiding exposure to the sun, and those exercises or duties which cause fatigue, and especially by abstinence from alcoholic liquors in excess.

Should, however, exposure be unavoidable, the body and head must be protected as much as possible from the heated atmosphere and the direct rays of the sun by suitable clothing, and provision should be made for a plentiful supply of drinking water. Overcrowding ought never to be permitted, and the use of tatties and punkahs should be insisted upon whenever many persons are congregated together, as in barracks and hospitals. After the attack has commenced, cold affusion is in most cases to be freely used; the water should be poured over the head, neck, and chest, and its use continued so long as the skin continues hot and dry. If however the skin is cold and clammy, it will be sufficient to sprinkle water from time to time over the face, and should the clamminess increase, and the pulse become feeble, the application of cold will be injurious; and in such cases, if the patient is able to swallow, stimulants should be given and sinapisms applied to the legs and epigastrium. Should the attack be followed by febrile symptoms, the treatment recommended for ardent fever is to be adopted, with the reservation that care must be taken lest, by carrying it too far, the heart's action is too much reduced.

YELLOW FEVER.—In certain countries, as the West Indies, the inter-tropical parts of America, and South-Western parts of Europe, a fever prevails during the hot seasons of the year which is known as "the yellow fever," on account of yellowness of the skin, which is a common symptom. It is unknown in India, and is said never to occur beyond the 48th degree of North latitude, nor below a temperature of 72° F., or at an elevation exceeding 2,500 feet above the level of the sea. The causes of it are not ascertained, but when once produced, there is no doubt that it can be propagated by contagion.

At first the symptoms do not materially differ from those of remittent fever, except that there is more nausea and vomiting, more pain in the back and limbs, and severe supra-orbital headache. The eyes also are in an unusual degree injected, and sometimes surrounded by a zone of redness. In the advanced stages the symptoms are more characteristic: the matters vomited have a black appearance (*black vomit*), and the skin becomes of a yellow colour; there is constant jactitation the face is expressive of great apprehension and distress; the tongue is red, and the urine and other secretions are scanty or suppressed; there is much uneasiness at the epigastrium, and the vomiting is urgent. After these symptoms have continued for a few hours or three or four days, they often to appearance subside, and the patient may even be able to sit up in bed. But this apparent relief is for the most part transient. Adynamic febrile symptoms soon set in: the pulse becomes frequent and feeble, the tongue dry and brown, and sordes collect about the teeth. The vomiting returns, and the matters thrown up resemble coffee grounds. Hæmorrhages take place from mucous surfaces, and blood is vomited or passed by stool; petechial spots and vibices also appear upon the skin. The face is expressive of apathy and indifference. At length the skin becomes cold and clammy, the pulse can scarcely be felt, and low muttering delirium sets in; dark-coloured fluid, like that vomited, is passed from the bowels; the breathing becomes slow and sighing, and the patient sinks from exhaustion. In favourable cases, after the period of abatement, secondary fever occurs, from which the patient sometimes recovers by a long convalescence.

There is much variety in the symptoms, depending upon the constitution of the patient, and the intensity of the exciting cause. In some cases the symptoms are as it were latent, the occurrence of "black vomit" alone indicating the nature of the attack.

Dr. Wood states, that "sometimes the patient is struck down suddenly with stupor or coma, and death is preceded by convulsions. Sometimes the most prominent symptoms are those of overwhelming precordial oppression, with a slow laboured respiration, and deep sighs and groans. Occasionally the force of the disease appears to be expended upon the stomach, producing incessant vomiting, with intense epigastric distress. In other instances the animal functions seem to be at first almost untouched. The patient may be walking in the streets, and nothing call attention to his case, unless it may be an unusual expression of countenance. Upon his pulse being examined, it is found to be exceedingly feeble, if not quite absent at the wrist. Black vomit and death speedily ensue.

These have been called *walking cases.* Again, there are instances in which the pulse is nearly natural, the tongue clean, and even the stomach calm from the commencement, but great anxiety and distress, with excessive restlessness, give occasion for alarm; and the worst apprehensions are soon confirmed by the occurrence of the black vomit and fatal prostration. Dr. Rush used to warn his pupils against the natural tongue and the natural pulse in yellow fever."

The cause of yellow fever is unknown. The disease prevails for the most part on the sea coast, and is rarely met with in inland districts. There is no reason to attribute it to malaria, and it differs in many important particulars from the fevers produced by that agent.

Persons newly arrived in countries where it prevails are more liable to be attacked by yellow fever than are persons longer resident, and adult natives generally escape. It sometimes prevails as an epidemic, and there is good reason to believe that it is contagious or infectious.

Yellow fever is a very fatal disease, and its treatment unsatisfactory. For full information on this and the whole subject of yellow fever, the student is referred to Dr. Wood's Practice of Medicine, it not being within the limits of this work to dwell upon diseases which do not prevail in the East Indies.

EXANTHEMATA.

There are certain fevers, always contagious or infectious, of which an eruption on the skin is a characteristic symptom, and which have this peculiarity, that one attack usually renders the individual insusceptible of a second attack.

The fevers of this class run a definite course which cannot be arrested.

VARIOLA. SMALL-POX.—Of the fevers above alluded to, small-pox is perhaps the most important, on account of its prevalence, and the mortality caused by it. Before vaccination was discovered, it is computed that one in fourteen persons born died of small-pox, and that the deaths caused by it at the time vaccination was introduced, were in Europe 210,000 and in England above 45,000 annually. So great is the severity of this terrible disease, that one person out of five attacked by it dies.

Small-pox has prevailed in India and China from the most remote periods, but it does not appear to have been introduced into Europe until the eighth century.

Symptoms.—In a period varying from seven to fourteen days after exposure to infection, febrile symptoms set in, which are peculiar in being attended with severe headache, pain of the back, and vomiting. These continue without abatement for three or four days, when an eruption of pimples appears upon the skin, whereupon the fever diminishes or subsides. The pimples continue to come out for two days; on the third day they are converted into vesicles, and on the fifth into pustules, which are at their height on the eighth day, when the eruption is said to have maturated. In mild attacks the patient is now convalescent, but in the more severe forms, a secondary fever sets in, and is attended with much danger. Two principal varieties or forms of small-pox are recognised, the distinction being founded upon the quantity and appearance of the eruption.

VARIOLA DISCRETA, *or distinct small-pox.*—In this, the most mild form, the pustules are not so numerous as to coalesce or run together, but remain distinct throughout the attack.

Symptoms.—The period of incubation, that is, the time which elapses between the reception of the poison and the occurrence of the first symptom, is from seven to fourteen days. The early or premonitory symptoms do not differ from the ordinary symptoms of fever, except that there is often urgent vomiting, with more headache and pain of the back. In some cases there may be wild delirium or even convulsions, especially in children. On the third day of the fever, small pimples are seen on the face, then on the neck, wrists, and body, and afterwards on the lower extremities, and they continue to come out for two days. Upon the third day they are vesicular, and on the fourth day each vesicle is depressed in the centre and surrounded by redness of the skin—*the areola.* On the fifth day the vesicle has become a pustule, and as this enlarges, the central depression is no longer visible. Upon the eighth day the pustules have arrived at maturity; they burst soon afterwards, and are covered by a scab, which four or five days afterwards falls off. The change from the vesicular to the pustular form is called "the maturation of the eruption." It is completed in the pustules on the face on the eighth day, but not in those on the extremities until two or three days later. When the eruption comes out, and during its progress, there is much itching, and when it assumes the pustular form severe burning pain. About the seventh or eighth day there is much swelling of the face and throat, and an increased flow of saliva. In many cases there is an eruption of white spots—but which do not contain lymph or pus—upon the mucous membrane of the mouth and throat, upon the conjunctivæ, inner surface of the prepuce, or lining membrane of the vagina in females. At the time of maturation a peculiar and offensive odour is exhaled from the patient's body.

The eruption may be so copious, that nearly every part of the skin is covered with it, or so scattered, that a few pustules only can be detected. However abundant it may be, each pustule is isolated, and pointed or acuminated.

The febrile symptoms often cease upon the coming out of the eruption, and are always lessened. There is slight recurrence or aggravation of them about the eighth day of the eruption—the period of maturation—but they altogther disappear a few days afterwards. After the pustules have burst, the swelling and pain soon subside, and by the fourteenth or fifteenth day the scabs have separated entirely from the face, but the desiccation of the pustules on the extremities is two or three days later. When the scabs have fallen off, red looking blotches remain, often for several months, and occasionally on the face there are depressed cicatrices (*pitting*) which are never effaced.

Variola Confluens *or Confluent Small-pox.*—When the pustules are so numerous on the face that they run together or coalesce, the disease is said to be confluent, and is attended with much danger. The initiatory fever is in general more severe than in the distinct variety, and attended with more derangement of the sensorial function. There is also more vomiting and pain of the back. The eruption appears earlier, and comes out confusedly, being often accompanied by a rash not unlike erysipelas. The pustules are flatter and less acuminated than in the milder form, and are often dark-coloured. Inflammation often extends to the subcutaneous areolar tissue, ending in the formation of pus, which burrows beneath the skin. Swelling of the throat is considerable, and the larynx and bronchial tubes are frequently implicated, when there is much danger of death by asphyxia. In all cases there is salivation, and sometimes the saliva becomes viscid. As maturation goes on, the face becomes greatly swollen, and the eyes are closed from swelling of the lids. The fever persists even after the eruption has come out, though it abates somewhat on its first appearance. About the eighth day secondary fever occurs, and often assumes an adynamic or typhoid character, in the course of which local complications are apt to arise. Those most frequently met with are pneumonia, dysentery, opthalmia, cerebral abscessess, boils, erysipelas, pyæmia, &c.

After the subsidence of the disease, the strumous diathesis is in some cases developed. Should the patient struggle through all these dangers, the scabs fall off, and numerous pits and scars —causing great deformity—are left, and in some cases one or both eyes are destroyed.

Varieties of confluent small-pox. Malignant small-pox.—In some cases the initiatory fever is prolonged to four or even five days, and is characterised by delirium and a badly developed pulse. The eruption is imperfectly developed, and although the urgent symptoms are somewhat abated upon its first appearance, they recur in a day or two, and terminate about the fifth day of the eruption in death by coma. Such cases are occasionally complicated with pneumonia. In other cases the pustules are filled with sanious fluid; petechial spots are seen upon the skin, and hæmorhage takes place from mucous surfaces. The state of the eruption just described is usually associated with extreme adynamic symptoms, and the attack often terminates fatally at an early period.

MODIFIED SMALL-POX.—Modified small-pox is that which occurs in persons who are protected, as by vaccination. The initiatory fever is sometimes severe, and lasts the usual period of three days. The eruption is scattered, and sometimes a few spots only are seen, or it may be copious or even confluent. Some of the pimples never even become vesicles, and the latter rarely become pustules. Desiccation commences about the fifth day. It is said that the characteristic odour of small-pox is never observed in the modified form. Secondary fever seldom occurs, and the danger of death or deformity is but slight.

Pathology.—There are no morbid appearances characteristic of small-pox, except the state of the skin and mucous membranes. Indications of disease in various organs are observed, according to the complications that may have occurred.

Causes.—Of the production of small-pox by contagion or infection there is no doubt. It is said to be one of the most, if not *the* most, contagious disease with which we are acquainted. The poison is received through the lungs, and through the skin when the variolous matter is placed in contact with it. It is not certain at what period of the disease the contagious emanations begin to be evolved; but there is reason to believe that they continue to be given off for some days after death. There is no doubt that the poison may adhere to clothes, and cause the disease even after many months have elapsed. It appears, however, to be rendered inert by being mixed with or exposed to the air. It is probable, if not certain, that small-pox has no other cause than contagion, at the same time it often prevails as an epidemic. Whether the epidemic influence operates by increasing the intensity of the contagion, or by rendering persons more susceptible of its action, is not known.

Small-pox epidemics seem to be most prevalent and severe in the spring months of the year in all countries; but in the Presidency towns of Calcutta and Bombay, this is so in a remarkable degree. In the summer and autumn, and early part of the winter, there is a remarkable immunity from small-pox.

Diagnosis.—The diagnosis of small-pox in the early stage is often difficult; but should a papular eruption appear on the face on the third day of an attack of fever, of which vomiting, pain of the back and headache were marked symptoms, little doubt need be entertained of its nature.

When the eruption has become vesicular, the central depression will distinguish the vesicles from those of any other eruption; but should there be doubt of its nature at the first appearance of the eruption, a few days will be sufficient to clear it up.

Prognosis.—The mortality from *confluent small-pox* has been already referred to, but in the other varieties the prognosis is generally favourable. The most favourable cases are those in which the eruption is not very copious, and the pustules are well developed, pointed, or acuminated. The disease is most fatal in very young or old persons, and especially so in pregnant women. Amongst the unfavourable signs, are unusual violence of the initiatory fever, or very copious eruption, and especially of imperfectly developed dark-coloured pustules; the continuance of marked febrile symptoms after the eruption has come out—the occurrence of severe secondary fever, &c.

Death may occur at any part of the course of the disease. The eighth day is generally said to be the most fatal, but many deaths occur at a later, and a few at an earlier period.

Treatment.—An attack of small-pox cannot be arrested, the treatment therefore must be restricted to fulfilling the following indications:—

1. To diminish the severity of the initiatory fever, and if possible the copiousness of the eruption. 2. To guard against and remove complications. 3. To allay suffering. 4. To support the patient's strength in the advanced stages.

In slight cases it may be sufficient to place the patient in a well ventilated room, and to administer diaphoretics and mild laxatives.

In the more severe cases, the initiatory fever may be lessened by saline diaphoretics and purgatives; should there be local complication at this stage, it might be necessary to have recourse to general or local bleeding—effervescing draughts may be given to allay vomiting. In those very serious attacks, in which from the commencement the symptoms are more or less adynamic, and the eruption imperfectly developed, stimulants are required. After the eruption has fairly come out, diaphoretics may be continued, and opiates given at night to procure sleep. When secondary fever occurs, diaphoretics during the day, and opiates at night with stimulants—should the pulse become feeble—constitute the chief treatment; but at this period, complications must be carefully looked for, and met as they arise, by such cautious local depletion as may be adapted to the general state of the system.

Opiates may be freely given, except in cases where there is marked cerebral complication. The diet should at first be restricted to congee, milk, &c. but as maturation is completed, animal broths should be freely given, and in most cases wine or brandy.

In any stage of the disease, stimulants must be given upon the first appearance of adynamic symptoms or of failing strength. In addition to internal remedies, attention should be paid to the eruption. When there is unusual inflammation of the face, cooling lotions may be applied, and as maturation is completed, the discharge may be absorbed by sprinkling a drying powder over the pustules, as powdered starch or calamine; and relief is sometimes obtained by anointing the skin with some soft cerate or oil.

Various measures have been adopted with the view of preventing the deformity which is sometimes left after an attack of small-pox. The best plan is said to be, to open each vesicle with a lancet as soon as it appears upon the face, and apply a piece of pointed caustic. Some recommend that the face should be covered with a mercurial plaster, openings being left for the eyes, nose, and mouth. It is stated that the vesicles then dry into tubercles and suppuration is prevented.

Others affirm, that anything which excludes the air is sufficient to prevent suppuration, and are in the habit of using collodion, gutta percha, &c. for this purpose.

PREVENTION OF SMALL-POX.

From very remote periods it has been known in certain countries, as in India and China, that the severity of small-pox may be materially lessened by artificially producing it—that is, by introducing under the cuticle, or placing upon a mucous membrane, matter from a small-pox pustule. The disease when thus induced, is found to be of a mild character, and but rarely fatal. This means of mitigating the severity of small-pox, *i. e.* "the practice of inoculation," has been long adopted amongst eastern nations, but it was not introduced into England until the beginning of the 18th century.

On the third or fourth day, after the matter has been introduced underneath the skin, a pricking pain is felt in the part, which feels hard, and upon the centre of the hard spot a minute vesicle may be seen. The vesicle becomes pustular, and is surrounded by a good deal of inflammation, and upon the sixth day there is pain with stiffness in the axilla. About the seventh day fever sets in, and in two or three days afterwards the eruption of small-pox appears on the skin. The pustules are seldom numerous, and are usually distinct—they follow the course of the eruption in *variola discreta,* and there is no secondary fever. The pustule produced by the inoculation bursts about the tenth or twelfth day.

The mortality from inoculated small-pox is about 1 in 400, and contrasting this with the fatality of natural small-pox, it might be thought that the introduction of inoculation had the effect of materially diminishing the mortality from this disease. But this does not appear to have been the case. The individual who had been inoculated was undoubtedly protected from an attack of natural small-pox, and with comparatively little risk, and without great suffering. But those persons who were not inoculated, were more liable to be attacked then before inoculation was introduced, by reason of the sources of infection being thereby increased; for it was found that small-pox produced by inoculation, was as capable of infecting other persons as that caused in the usual way.

Whilst discussions were going on as to the advantage or the reverse of small-pox inoculation, the practice of vaccination was introduced, by which inoculation has been in a great measure superseded, and in some countries prohibited by Legislative enactment. In India, however, it is still largely practised.

VACCINE DISEASE.—*Cow-pox.*

The vaccine disease, or cow-pox, is a pustular affection of the skin, which can be conveyed from one person to another by inoculation, but not by infection or contagion, and which has the property of protecting the individual, in a greater or less degree, from an attack of small-pox. The disease was first discovered in the cow, and from that animal conveyed by inoculation to man, hence the designation *vaccine disease* or *cow-pox.*

The belief in the existence in the cow, and perhaps also in some other domestic animals, of a disease which, being conveyed to man, rendered him insusceptible of the infection of small-pox, had been long entertained in many parts of the world; but it was not until about the year 1798, that the knowledge of this fact was made practically available. Dr. Jenner, an English Physician, has the merit of being the first to practise vaccination. His attention was directed to the subject, by the discovery, that persons employed in milking cows, contracted a pustular disease upon the fingers, which appeared to protect them from an attack of small-pox. He ascertained that the vaccine disease having been conveyed to man, might be transmitted by inoculation to other persons, and at length experiments were made, which were conclusive as to its power of affording protection against small-pox. The practice of vaccination has been extended in a greater or less degree to all the civilized parts of the world.

Dr. Jenner pointed out the resemblance between the cow-pox pustules and those of small-pox, and from experiments instituted within the last twenty-five years, there is little doubt that there is a close relation between those diseases, if they are not absolutely identical.

Vaccination.—By vaccination is understood the performance of the slight operation which is necessary for imparting the vaccine disease. This consists in introducing under the cuticle a small quantity of lymph from a vaccine vesicle. After the operation, there is at first a little redness from slight inflammation caused by the puncture, but this soon disappears. On the third day, or even later, a small red, hard, slightly elevated pimple may be seen, upon the summit of which a minute vesicle is apparent under a magnifying glass. About the fifth or sixth day the vesicle is visible to the naked eye. It is circular in shape, elevated at the edges, and depressed in the centre. Its colour is at first light pink, but it gradually becomes of a pearly hue. The centre, which is darker than the margin, is composed of a number of cells, that contain clear transparent lymph, and which is most active when small in quantity. About the eighth or ninth day the surrounding skin is red and swollen (*areola*), and the vesicle is soon afterwards changed into a pustule. Upon the tenth day the areola has much increased, and is sometimes from one to one and a half inches in diameter. It remains for a day or two, and then begins to fade. After the tenth day the pustule bursts, a scab forms, which separates about the twentieth day, and leaves a circular depressed cicatrix, in which there are numerous pits, caused by the cells of which the vesicle has been composed. Between the seventh and eleventh days, in some cases, but by no means in all, there are slight febrile symptoms.

As regards the severity of the disease there is much difference: sometimes it is very mild, at others there is much inflammation and swelling of the axillary glands and sympathetic fever, and this is more often the case in adults than in children.

The vaccine disease does not always follow the course which has been described: in some cases several days or even weeks pass over without any appearance of a vesicle; at other times its course is hastened, the vesicle arriving at maturity on the fifth or sixth in place of the eighth day. So also there is much difference in the size and appearance of the pustule. It is said that the variations just stated may exist without the protective influence of vaccination being impared; but I should distrust its efficacy if there should be any considerable departure from its usual course.

When virus is impure, a spurious form of the vaccine disease is produced, which must on no account be mistaken for it. The vesicle, which is not umbilicated, begins to form very early, and is soon covered by a yellowish crust, which separates about the fifth day.

In the hot and rainy seasons of the year, in some parts of India, the vesicle is of small size, and arrives too soon at maturity. The protective influence of the disease at such times is probably but little.

Much care is required for the successful performance of vaccination. 1*st.*—In selecting suitable lymph. 2*nd.*—In the mode of introducing it.

1*st.*—Lymph should be taken upon the 7th or 8th day of the disease, before the areola has formed, and whilst it is clear and transparent. It should be introduced as soon as possible after being removed from the vaccinated child, and when possible directly from the vesicle. For supplying lymph a healthy child should be selected, and especially one that is free from cutaneous disease.

When virus is to be conveyed to any distance, or kept for use, it may be placed upon a piece of glass, another piece of the same size being placed over it; or it may be taken upon the point of a lancet or little pointed piece of bone or ivory. A very excellent mode of preserving lymph is to collect it in capillary tubes, which are afterwards hermetically sealed. By means of the scab the vaccine disease can also be propagated, and there is perhaps on the whole, scarcely any better mode than this of preserving lymph in temperate climates. In the tropics the scab is apt to be destroyed by the high temperature. A well-formed vesicle should supply sufficient lymph to vaccinate five or six children.

2nd.—The age of the child at which vaccination should be performed is between the 6th and 8th week. The part in which the punctures are usually made, is the outer side of the arm near the insertion of the deltoid muscle. The virus having been taken upon the point of a lancet, is introduced beneath the cuticle, care being taken not to make the puncture so deep as to cause much bleeding, lest the virus be washed out; at the same time the appearance of blood is necessary, to show that the surface of the skin has been reached. The number of punctures may be two or three in each arm, and they should be about a line distant from one another. The object of making several punctures, is to ensure the success of the operation, and to permit of lymph being taken for vaccinating other persons. One vesicle, at least, must pass through all its stages without being interfered with.

It has been a question whether or not one vaccination is sufficient to protect a person from small-pox during the whole of his life. The opinion is, I believe, now very general, that lapse of years diminishes its protective power, and that re-vaccination should be practised.

It is not to be supposed, that persons who have been successfully vaccinated are altogether exempt at all times from small-pox. In places and seasons where the disease is epidemic, the vaccinated are not unfrequently affected; but in most the attack is mitigated, and it assumes the form of modified small-pox. As regards susceptibility to the vaccine disease, it may be mentioned, that it cannot be produced in all persons, nor in the same person at all times, so that the operation requires in some cases to be repeated several times, and every now and then all attempts to produce it are unsuccessful; but this is comparatively rare.

Varicella or Chicken-pox.—This is a mild and unimportant disease: after slight premonitory fever, which lasts for about twenty-four hours, an eruption of pimples appears—generally on the back—on the second day the pimples have been converted into vesicles, which attain maturity upon the third day, after which a thin scab forms; by the fifth day the scab falls off, leaving no scar. Chicken-pox is contagious, and is quite distinct from small-pox, from which it may be known by the slight and short initiatory fever, by the appearance of the eruption first upon the back, and by its not becoming pustular, and by its disappearance by the fifth day. No special treatment seems necessary.

Rubeola.—Morbilli.—Measles.

Symptoms.—Measles sets in with fever, of which catarrhal symptoms—corysa sneezing, and running from the eyes, dry cough, hoarseness, &c. are prominent characters. Upon the fourth day of the fever, or later, an eruption appears on the face, and afterwards on the trunk and extremities. It continues to come out for three days, and begins to fade in three or four days after its first appearance. The eruption consists of minute papillæ, of a deep red colour—not unlike flea-bites—arranged in clusters, which have a crescentic shape. From the fifth to the eighth day the patches begin to fade, and in two or three days entirely disappear by desquamation of the cuticle.

The fever usually continues throughout the attack, but the catarrhal symptoms often diminish or subside upon the coming out of the eruption. In favourable cases, convalescence is established upon the eighth day, but sometimes, when the catarrhal symptoms have been severe, bronchitis supervenes, by which the attack is prolonged.

The course of measles is subject to much variety. In some cases the eruption is slow in appearing, and in others it even recedes after it has come out; these irregularities, and especially the latter, are often indications of danger. Every now and then, either from some peculiarity in the constitution of the person affected, or in the epidemic influence, measles assumes a malignant character: the sedative influence of the poison may be such, as that there is little reaction; or reaction having come on, there may be symptoms resembling the worst forms of typhus fever.

An attack of measles is often accompained by inflammation of internal organs: the lungs and bronchial tubes are the most common seats of it, but other parts may be affected; enteritis is said not to be uncommon, and diarrhœa is often present, but is not in general a source of danger. A troublesome complication of measles is ophthalmia, and a severe and dangerous, though rare one, inflammation of the larynx. After an attack of measles, it is not uncommon for diseases of various kinds to be left or developed, as chronic laryngitis, cutaneous affections, ophthalmia, enlargement of lymphatic glands, &c. Where there is a predisposition to tubercular deposits, their occurrence appears to be favoured.

Causes.—The cause of measles is without doubt a specific contagion, and although, like other infectious or contagious diseases, its prevalence and severity are influenced by epidemic causes, it is at least doubtful if it can occur independently of contagion.

The period of incubation is from about seven to fourteen days.

Diagnosis and prognosis.—The initiatory fever may generally be distinguished from that of the other exanthemata by the catarrhal symptoms. The distinction between the eruption of measles and scarlet fever will be considered under the latter disease.

The prognosis in uncomplicated measles is for the most part favourable. The malignant form is always dangerous, and internal inflammations, which may prove serious, are at all times liable to occur.

The most unfavourable signs, are unusual severity and continuance of the early fever, with postponement of the eruption; sudden disappearance of the rash, in connection with evidences of internal irritation or great prostration; severe dyspnœa, and other symptoms of considerable pulmonary inflammation; great restlessness, delirium, or coma; continuance of fever, cough, and dyspnœa, after the regular decline of the eruption; complete loss of voice with dyspnœa, and evidences of malignancy, such as weak pulse, a livid colour of the rash, petechiæ and passive hæmorrhage.

Treatment.—The patient should be placed in a moderately warm room, from which draughts of cold air are excluded.

In mild cases, nothing more is required than restriction of the diet and the use of laxatives, but complications must be carefully watched for and treated as they occur. In others more severe, mucilaginous drinks and saline diaphoretics may be given, and to which, in some instances, small doses of tartar emetic are to be added after the eruption has come out; if the cough is troublesome, opiates and expectorants are to be used. Should the eruption suddenly retrocede, and symptoms of internal derangement or disease be set up, the patient may be placed into a hot water or vapour bath, and warm drinks given with advantage.

During convalescence, care is necessary to protect the patient from the sudden application of cold. The malignant variety of measles requires similar treatment to that for typhus fever.

SCARLET FEVER. SCARLATINA.

Symptoms.—After one or two days of initiatory fever, varying much in severity, and accompanied by more or less inflammation of the throat, a rash makes its appearance upon the neck, face, and breast, and in the space of twenty-four hours spreads over the trunk and extremities. It first shows itself as numerous red spots, which soon coalesce and form large bright vivid red blotches, not much elevated, and without any determinate form. The redness disappears by pressure, but almost directly returns. The rash continues for three or four days, and then begins to fade, and disappears by desquamation of the cuticle from the fifth to the eighth day. Although the rash generally appears on the second day, it has been noticed much earlier, and in some cases almost as soon as the febrile symptoms; and, on the other hand, it has been known not to appear until the fifth day of the fever. There is no abatement of the fever upon the appearance of the eruption, and the pulse is more frequent than in most other febrile diseases. The heat of skin is remarkably great. The fever exacerbates towards evening, and during the night there is often delirium. The tongue is at first white, but afterwards red; the papillæ are raised and prominent. It has been compared in appearance to a strawberry. Nausea and vomiting are not uncommon symptoms; the bowels are constipated, and the urine is scanty and high-coloured.

Inflammation of the throat, in a greater or less degree, is present in all cases of scarlet fever. The patient has difficulty in swallowing, the tonsils are enlarged, and the mucous membrane over them and the soft palate is covered with tenacious mucus. The mucous lining of the mouth, throat, and nose is of a bright red colour. The extent to which the throat is involved varies much: in some cases it does not extend beyond that of angina diffusa (page 355). In others there is much swelling, not only of the fauces, but even of the neck.

The attack reaches its height in from five to nine days; in favourable cases the symptoms subside and recovery is speedy, but in many instances, during desquamation of the cuticle, the urine is found to contain albumen and epithelial casts, in which case there is a tendency to dropsy, which will be presently noticed.

But it is not only at the termination of the disease that there is danger. In severe epidemics of scarlet fever, the patient may die from the sedative influence of the poison in the course of a few hours, and throughout the attack there is danger from coma and visceral complications, or from the inflamed state of the throat. In some cases the symptoms early assume a typhoid character.

Varieties of scarlet fever.—In some cases inflammation of the throat is very slight, and the symptoms generally are of so mild a character, that the patient may not even be confined to bed. This is called *scarlatina simplex*. In others, the throat affection is a prominent part of the attack, and when this is so, the eruption is slower in appearing, and less copious and general. As the disease advances, the fauces, tonsils, soft palate, and uvula are swollen and covered with ash-coloured patches of exudation, upon the removal of which the surface of the membrane is found to be reddened. The parotid and sub-maxillary and lymphatic glands are also swollen and painful, viscid tenacious mucous collects in considerable quantity in the throat, and causes much distress. Sometimes the lining membrane of the nose is also inflamed. The designation *anginosa* is usually applied to this form of the disease, which, it need scarcely be said, is much more serious than scarlatina simplex. When the symptoms from the first, or during the progress of the disease, are characterised by great depression and prostration, the eruption being of a dark colour, the disease is called *scarlatina maligna.*

After an attack of scarlet fever, abscesses often form in the neck, in the neighbourhood of the parotid gland, or in the ear, the discharge from which retards convalescence, and sometimes causes fatal exhaustion. There seems also to be a tendency to inflammation of serous membranes. During, and for some time after, the period of desquamation, the patient is liable to dropsy, and this is said to be more common after slight than severe attacks. The urine is albuminous and contains epithelial casts (page 269).

Causes.—Scarlet fever, like the other exanthemata, is caused by a specific contagion, but it is subject to epidemic influence, which often determines the severity and prevalence of the disease. There is reason to believe, that the contagion is less virulent then that of most other contagious diseases. The susceptibility to the disease diminishes from childhood upwards. The period of incubation is said to be five days.

Diagnosis.—The only peculiarity of the initiatory fever, is unusual frequency of the pulse and redness of the fauces. The eruption may be distinguished from that of measles, by its early appearance and bright red colour, and the absence of crescentic shaped patches. The throat complication and absence of catarrhal symptoms will also aid in the diagnosis.

Prognosis.—The prognosis must always be guarded. Mild cases are apt to assume a dangerous character, and, on the other hand, the most unpromising cases sometimes recover. And it must not be forgotten, that the dangerous sequelæ of scarlet fever are not uncommon after the mildest attacks. During pregnancy, an attack of scarlet fever is very often fatal. The worst cases are those in which the eruption is of a dark colour and mixed with petechiæ, and the fauces covered with grangrenous sloughs or ulcers.

Treatment.—In *scarlatina simplex* but little treament is required beyond confining the patient to the house, restricting the diet, and attending to the clothing and the state of the bowels.

In *scarlatina anginosa* the treatment may be commenced by an emetic, followed by a moderately active aperient. The skin should be sponged with tepid water, and saline diaphoretics administered. If there should be symptoms of prostration—as indicated by a feeble pulse—stimulants must be given, and the strength supported by chicken broth, wine, &c. The treatment of the malignant form is the same as that for typhus fever. The chlorate of potass is said to have been useful in the malignant forms of scarlet fever.

Many remedies have been applied to the throat. The best are probably those which are used in diphtheria* (page 356).

DENGUE. *Scarlatina rheumatica.*—In America, the West, and in certain parts of the East Indies, a fever occasionally prevails which bears some resemblance to scarlet fever. It sets in with the usual symptoms of fever, but with more than the usual weariness and pains of the limbs. The small joints become swollen, and the lymphatic glands of the neck, axilla, and groins, and sometimes also the testicles are enlarged and painful. The febrile symptoms subside in from twelve hours to three or four days, and often with profuse sweating and symptoms of collapse. The remission lasts for a day or two, when the fever returns, accompanied by a scarlet eruption on the skin; upon the fifth day an eruption appears on the palms of the hands, and afterwards on the body, at which time the febrile symptoms subside. The character of the eruption is not always the same: it is said sometimes to resemble the rash of scarlet fever, and at others that of measles, whilst occasionally it is vesicular or pustular. In some instances inflammation of the throat seems to take the place of the articular pains. The duration of the attack is usually about eight days.

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* Scarlet fever is altogether unknown in Western India. It occurred in some of the military stations of the Madras Presidency soon after the arrival of ships with the families of soldiers, the disease having prevailed on board; but I am not aware that it has spread to the native population, or continued to prevail amongst those by whom it was imported.

No special treatment is required for this form of fever, which is unattended with danger.

ERYSIPELAS. *St. Anthony's fire. The Rose.*

Erysipelas is inflammation of the skin, or of the skin and areolar tissue, due to certain states of the system, which are sometimes induced by epidemic, and perhaps also contagious causes. Erysipelas is not a common disease in tropical countries, and does not prevail in an epidemic form. There are two varieties, *idiopathic* and *traumatic*.

IDIOPATHIC ERYSIPELAS.

Symptoms.—An attack of erysipelas usually commences with febrile symptoms. In a few hours, or a day or two, some part of the skin, often that of the face, becomes of a bright scarlet or dusky red colour, and the redness in general spreads. There is slight swelling and much burning pain. In severe cases vesicles or bullæ form. The fever continues until the inflammation subsides, which it does in favourable cases by desquamation of the cuticle on the eighth or tenth day. In unfavourable cases, the fever assumes the characters of typhus, from which death may take place by exhaustion or coma. Sometimes the areolar tissue is extensively involved (*erysipelas phlegmonodes*), and suppuration or even gangrene may occur.

Idiopathic erysipelas most commonly attacks the face. It causes great swelling and distortion of the features : the eyes are closed from swelling of the lids. From the face it often spreads to the scalp, in which case the membranes of the brain are not unfrequently involved, as evidenced by headache and delirium, muscular twitchings, &c. and those symptoms, and others indicating derangement of the brain and spinal cord, may continue for some time after the attack. In most cases, when the head is affected, there is more or less inflammation of the throat. The accompanying fever may be *sthenic*, but in the great majority of cases it is of a low type, and sometimes typhoid or irritative.

Causes.—The causes of erysipelas are not well understood. There are certain conditions which predispose to the disease, as weakness or debility, dropsical states, &c. But the greatest predisposition seems to be given by certain peculiarities of the atmosphere, which are not uncommon in hospitals and barracks, &c. Upon what these peculiarities depend, or what is their exact nature, we do not know. When they exist in an intense degree, the slightest local irritation seems to be sufficient to cause erysipelas, or it may even arise without any traceable exciting cause. There is much ground for believing that erysipelas is sometimes contagious, and conclusive evidence that it prevails epidemically. Many persons believe that puerperal fever and erysipelas are one and the same, or interchangeable diseases; that is, the contagion of puerperal fever may produce erysipelas, and that of erysipelas cause puerperal fever.

Diagnosis.—The initiatory fever of erysipelas cannot be distinguished from that of other diseases, but when the skin has become inflamed, there is no disease with which erysipelas is likely to be confounded.

Prognosis.—Simple erysipelas, not affecting the face, is not in general attended with danger; but when it is very extensive, or the areolar tissue much involved, or when the symptoms assume a typhoid character, the result is unfavourable. In erysipelas of the face, the prognosis should always be guarded.

Treatment.—In persons who are robust and plethoric, general blood-letting may be practised, but this is rarely necessary, and in most cases would do harm. The bowels should be freely acted upon by an active aperient, the diet restricted, and the patient confined to bed. In a large proportion of cases, the accompanying fever is more asthenic than sthenic, and hence a supporting and stimulating mode of treatment is frequently indicated. Milk, animal broths, and wine should be freely given, and in many instances the sesquicarbonate of ammonia may be added. Some persons have observed benefit from the tincture of the sesquichloride of iron, but in my hands it has seemed to be useless.

Many local applications have been used in erysipelas, but few have been very successful, and some are injurious. As a means of cure, I doubt if any local application should be used, but the burning pain is sometimes relieved by anointing the part with some mucilaginous fluid, dusting it over with flower, or laying upon it cloths moistened with a weak solution of the acetate of lead. When the inflammation is spreading, it is thought that it may be arrested by drawing a line of circumvallation with nitrate of silver or tincture of iodine.

PLAGUE. *Pestis.*—In Egypt, Syria, and a few other places in Asia Minor, a febrile contagious disease known as *Plague* prevails, in which there is inflammation of the lymphatic glands, or the formation of carbuncles on various parts of the body. It was at one time more largely distributed, and committed great ravages in many parts of Europe.

The attack is in general sudden, and the symptoms at first do not differ from those of other fevers. Soon, however, pains are felt in the situation of the lymphatic glands and other parts of the body, followed by swelling of the glands and carbuncles. The swellings increase, and as the disease advances, the tongue becomes dry, and sordes collect about the teeth. Great pain is felt in the precordia, and there is often nausea and vomiting, blood being mixed with the matters that are vomited. In the advanced stage there is great prostration of strength, the patient is scarcely able to stand, and staggers if he attempts to walk; the breathing is hurried, and the mind confused—profuse sweating often occurs. In the early morning there is a remission, and an exacerbation about noon. When perspiration takes place about the third day, there is often from that time progressive improvement, ending in convalescence. In unfavourable cases, as the disease makes progress, adynamic symptoms set in: the pulse becomes very feeble, petechiæ appear on the skin, and hæmorrhage takes place from mucous surfaces. Low muttering delirium, ending in coma, often precedes the fatal termination.

Plague presents itself in varying degrees of severity. When the poison which produces it is very intense, or the individual unusually susceptible of its action, death may occur in a few hours without reaction. On the other hand, under opposite circumstances, the disease may be of a mild nature, terminating favourably at the end of eight or ten days. Between these extremes, is the most common form of the disease, in which there are often two exacerbations and remissions in the twenty-four hours, presenting the characters just described.

The glandular swellings may occur at the same time as the febrile symptoms, but in general they come on afterwards, and sometimes not until towards the close of the disease. They may disappear without suppuration, but this is rare. The carbuncles are later in their appearance. Petechial spots are only present in the worst cases.

Causes.—There seems to be little doubt that plague is contagious, but there is reason to believe that there are other causes, the nature of which has not been ascertained. That the propagation of the disease is favoured by defective sanitary arrangements does not admit of doubt. It is also certain that it is greatly influenced by epidemic causes. Plague is said not to occur when the temperature is much below 60° or above 80°.

DIAGNOSIS AND PROGNOSIS.—The occurrence of buboes and carbuncles will be sufficient to distinguish plague from most other febrile diseases. As regards prognosis, it is at all times a dangerous disease; but when adynamic symptoms are not well marked, and buboes appear early, and there is moderate perspiration about the third day, a favourable result may be anticipated.

Treatment.—There is no special treatment for plague, and bad cases run their course, little influenced by any that has been adopted. At the commencement of the attack emetics and cathartics are usually given; during the stage of febrile excitement diaphoretics are used, and when there are signs of depression, stimulants are freely administered.*

INFECTIOUS REMITTENT FEVER.—There is ground for believing that remittent fever may be sometimes infectious. In various parts of extra tropical India, usually after seasons of dearth and famine, a fever of a remittent type with marked adynamic symptoms has been observed, and which spread by infection. It chiefly prevailed amongst the poorest classes of the people, and was very fatal, it being computed that four-fifths of those attacked with it died.

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* Plague being unknown in India has been but briefly described.

It is often called the "Pali disease," from the name of a place where it once extensively prevailed. In the North-Western provinces it is known by a native name—"Mahamurree." As justly remarked by Dr. Morehead, designations of this kind are open to much objection. The chief peculiarity of the fever now noticed, in addition to marked adynamic symptoms, which attended it, was the occurrence of buboes, *i. e.* enlargement of the lymphatic glands in the groins and axillæ.*

CHAPTER II.

EPIDEMIC DISEASES.

The effect of epidemic influence in modifying the severity and prevalence of various diseases has been already noticed (page 107). There are however some diseases which appear to have no other cause. These will form the subject of the present chapter.

Epidemic Cholera. *Spasmodic Cholera. Asiatic Cholera.*—The disease which is known as epidemic cholera has probably prevailed to a greater or less extent in India from the earliest periods. In the year 1817 it first attracted much notice on account of a severe epidemic which occurred in Bengal. Since then it has travesed the greater part of the civilized world.

Symptoms.—An attack of cholera sometimes takes place suddenly, and not unfrequently in the night, but more often it is preceded for a longer or shorter time by diarrhœa.

After diarrhœa has existed for a few hours, or a day or more, the patient is attacked with vomiting, and the evacuations from the bowels become of a pale colour, not unlike thin congee. The matter vomited may be a watery fluid, or similar to that passed by stool. There is great restlessness and anxiety, and the patient becomes collapsed: the skin is cold and clammy, the face pinched and shrunken, and the eyes sunken. The pulse is barely or altogether imperceptible, the voice almost lost, and the breath cold. There is much thirst and a feeling of internal heat, which causes great distress. Not unfrequently there are cramps, especially of the muscles of the legs. The secretions are suspended; the stools contain no bile, and no urine is passed. The mind is rarely affected.

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* Transactions of Medical and Physical Society of Calcutta and Bombay.—Indian Annals.—Morehead's Clinical Researches.

There is much difference in regard to the rapidity with which collapse occurs. In some cases vomiting and purging and cramps may continue for several hours before the temperature of the skin is much reduced or the pulse has lost much strength. Such attacks are most common amongst robust Europeans, and are seldom met with in Natives. In other instances, both in European and Natives, the pulse loses strength from the first, but the skin does not become cold and damp, nor the face shrunken, until the characteristic vomiting and purging have existed for several hours, and the pulse even then, though feeble, is still distinct. In a third set of cases collapse is the marked and prominent symptom: after vomiting and purging, sometimes of very short duration, or even coincident with their first occurrence, the face becomes pinched and shrunken, the skin icy cold and damp, the pulse imperceptible, and the respiration hurried. The discharges are comparatively inconsiderable in quantity, and according to some observers there may be neither vomiting nor purging. These cases often run a rapid course, and recovery is rare.

Progress.—In the milder forms of the disease, collapse may be arrested and the secretions gradually restored; in more severe forms it may increase and cause death; or there may be reaction with consecutive fever, and sometimes inflammation of an important organ, from which the patient may die. In still more severe forms the collapse persists or increases—although the discharges may have been much lessened or have ceased—and the patient dies from exhaustion within a few hours.

But it often happens that the stage of collapse is recovered from, and this may be equivalent, in favourable cases, to complete recovery, the secretions being quickly restored.

In the majority of cases however this is not so; in many reaction is imperfect: the pulse becomes distinct, but continues feeble; the skin, though less cold, is still below the natural temperature, and the secretions continue to be suppressed. The patient may remain in this state for several hours or a day or more, when the collapse returns: the pulse can no longer be felt, and the skin is cold and clammy—death speedily follows. In other cases reaction is perfectly restored, but soon becomes excessive; the skin is hot and dry, the conjunctivæ are injected, there is headache with delirium, and the patient becomes drowsy and comatose. In many instances, with more or less perfect reaction, the secretions are still suppressed: no urine is passed; the patient becomes sluggish, and the conjunctivæ are injected; drowsiness afterwards comes on, followed by coma and death; or the secretions being slowly restored, there may be gradual recovery.

In asthenic persons it is not uncommon in the stage of reaction for gastro-enteritis to occur: the tongue is florid at the edges and tip, and coated in the centre; there is frequent vomiting, and more or less tenderness at the epigastrium. The skin is slightly hot and dry, and the pulse accelerated. These symptoms may become aggravated, and the patient die; or, as in cases of sub-acute gastritis, there may be slow recovery.

A few remarks may now be made upon some of the more important symptoms.

Discharges.—The discharge from the intestines, of a pale coloured or milky fluid, is the most pathognomic sign of cholera. Sometimes the milky fluid has a pinkish tinge—this seems to depend upon the presence of blood. In some epidemics it is never seen; in others it is very common. Dr. Morehead states that he has never met with an instance of recovery when the evacuations presented this appearance. My own experience is not quite the same, but I believe it to indicate a very severe form of the disease.

The copiousness of the discharges is not related to the severity of the attack, and I much question if it is any part of the treatment to attempt to arrest them. The change in the colour of the evacuations from white to brown is at all times favourable; at the same time it often happens, that they retain their milky appearance for many hours after reaction has been restored.

Secretion of urine.—The secretion of urine is quite suppressed in severe attacks of true cholera. Its restoration is in many instances coincident with the first appearance of recovery, but in some the suspension continues after collapse has been recovered from. The danger arising from suppression of the urinary secretion is greatest when reaction has been rapid. When the collapse has been of long continuance, there may be no secretion of urine for several days without the supervention of symptoms of uræmic poisoning.

Cerebral function.—There is the greatest possible difference in the state of the mind in the collapsed stage of cholera. Some persons are anxious and apprehensive in the highest degree; others are apathetic and indifferent, and apparently careless of the result.

Cramps.—There is no symptom so variable in cholera as the occurrence of cramps. In some cases these are so severe, that the suffering from them is almost unbearable, in others they are scarcely complained of.

Pathology.—Notwithstanding the attention that has been paid to the investigation of the subject, the pathology of cholera is very imperfectly understood. The appearances found after death in the collapsed stage have little direct relation to the symptoms. The vessels of the membranes and of the brain are usually congested, and more than the ordinary quantity of serum is found within the cranium. Evidences of congestion may also be observed in almost every organ. The glandular structures of the intestinal canal are unduly prominent, and especially the solitary and aggregated glands in the ileum. The mesenteric glands are generally enlarged.

When death takes place in the stage of reaction, the kidneys are congested, and the uriniferous tubes filled with epithelial debris. At this stage appearances of inflammation of the lining membrane of the intestinal canal are often observed.

The blood is much altered in cholera. Its density, it need scarcely be said, is greatly increased by reason of the quantity of fluid that has been separated from it. The water of the blood first transudes through the coats of the vessels, afterwards the inorganic solids in solution, and at a later period the organic solids. The colour of the blood is always dark, and in many cases its coagulability is lost. What the effect of the altered density of the liquor sanguinis may be upon the blood corpuscules has not been particularly noticed, but it is quite certain that they must undergo change.

The explanations which are given of the immediate cause of the symptoms of cholera, are little more than speculations. The one most entitled to belief is, that some kind of poison, which alters the blood, is received into that fluid. But in whatever way effected, the arrest of the circulation in the capillaries requires to be carefully noted.

Causes.—That cholera is due to epidemic causes, and that its outbreak in a town or province may often thus be explained, does not admit of dispute. At the same time there is unquestionable evidence that it *may* be conveyed from one person to another, although it is probable that the contagion of cholera is not very virulent, or that most persons are less susceptible of its action than of that of most other contagious affections—hence it follows that the spread of cholera by human intercourse is very limited.

The causes which predispose to cholera are not well known. Elevated temperature is often assigned as a predisposing cause, and certainly the prevalence of the disease in the Eastern tropics might be supposed to support this opinion. But the disease has prevailed with the utmost severity in the coldest climates, and Dr. Morehead has shown that in India it does not prevail more in the hot months than at other seasons of the year.* Nor am I disposed to attach much importance to the meteorological changes which are supposed by some to predispose to, if not excite, an outbreak of cholera. Some of the worst epidemics of cholera in Bombay have occurred in the coldest months of an unusully cold season, and when there was no evidence whatever of any atmospherical disturbance. That there are local causes which predispose to cholera, seems more probable. It has been known to prevail in one part of a town whilst other parts have escaped ; indeed, it has been restricted to one side of a street, or even to a single house. But we are very much in the dark as to what these so-called "localising circumstances" really are. Impure water, want of cleanliness, and the emanations from cesspools, &c. are often stated to be the main circumstances; but more full and precise information than we as yet possess is necessary before we can determine the relation between such influences and this disease. It is not of course meant, that persons whose health is deteriorated by living in localities where sanitation is neglected, may not be more liable to cholera than others who breathe pure air, just as they are more liable to all other diseases ; but I think it remains to be proved, that there is any special or different relation between these conditions and cholera, than exists between them and other epidemic diseases.

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* Clinical Researches, page 204.

That the aggregation of large numbers of persons in a limited space predisposes to, if it does not actually cause, cholera, seems to be proved by the frequent outbreaks of the disease in jails and camps, and amongst pilgrims to the various shrines of India.

It is stated, that in all countries the lower classes of the community suffer more in proportion to their numbers than the higher classes, and that the higher class of European residents in the Presidency towns of India are in a remarkable degree exempt from it. Without denying the truth of this statement, it seems to me that in India the data are wanting for a satisfactory elucidation of the question. The effect of long marches in predisposing to cholera is well ascertained, and nothing is more certain, than that the encampment of a Regiment on the line of march, upon ground which has been recently occupied by another Regiment, is very frequently followed by the occurrence of the disease amongst the soldiers.

Attempts have been made to determine the relative frequency of cholera amongst different classes of the Native community in India, but in the absence of anything like an accurate census of the population, such attempts must necessarily be abortive.

Diagnosis.—The appearance of the alvine discharges, the collapse, and suspension of the urinary secretion, distinguish cholera from all other diseases.

Prognosis.—The prognosis in cholera must always be guarded, even before collapse has set in. In the commencement of an epidemic visitation, it is very generally unfavourable. Towards the end of the epidemic many cases recover. Dr. Morehead states, the mortality as about from 30 to 45 per cent. in regimental hospitals, 50 to 55 in the European General Hospital, and 60 to 65 in general hospitals for the civil Native population of large towns, as the Jamsetjee Jejeebhoy Hospital in Bombay.

Treatment.—During the premonitory diarrhœa, the purging should be checked by an opiate, with which, in asthenic persons chalk and catechu may be combined, and in sthenic persons, when the tongue is coated, ten grains of calomel. Upon the first appearance of collapse, or even before, stimulants, as brandy, ammonia, &c. should be given. If diarrhœa continues in spite of these measures, the evacuations not being pale and congee like, more active astringents may be prescribed, as acetate of lead, dilute sulphuric acid, &c.

When collapse has fairly set in, heat should be assiduously applied to the surface of the body by means of hot bricks. Moderate doses of liquor ammoniæ should be given at short intervals, and sago or arrowroot, with brandy or arrack, every second hour. It is very doubtful if any more active measures are likely to be beneficial, and they may be injurious. When the collapse has passed off, should the secretions not be restored, one or two doses of calomel or blue pill are often given with advantage, and diuretics may be cautiously tried.

In cases where reaction is attended with drowsiness, injection of the conjunctivæ, &c. a blister should be applied to the nucha or scalp, and in some cases a few leeches to the temples; and should there be no gastric complication, eight or ten grains of calomel may be given and repeated. When there is sub-acute gastritis, a sinapism to the epigastrium and the administration of effervescing draughts will generally be necessary.

CHAPTER III.

BLOOD DISEASES.

RHEUMATIC FEVER. *Acute Rheumatism. Fever, probably due to a "materies morbi" in the blood, and accompanied by inflammation of the joints and some of the fibrous tissues.*

Rheumatic fever is very common in temperate climates, but is only occasionally met with in the tropics. It is of much importance, on account of the severe suffering which attends it, and the probability of inflammation being set up in the heart and its membranes.

Symptoms.—The attack commences with fever, which may continue for twenty-four hours before there is any appearance of local inflammation; or the latter may occur at the same time as the fever, or in rare cases precede it. The chief peculiarity of the febrile disturbance is, that the skin, though hot, is usually moist, and sometimes covered with profuse sweat, which has a sour smell. The tongue is in general much furred, and the pulse full and sometimes strong and firm, but more frequently soft and compressible. The bowels are generally constipated, and the urine—scanty and high coloured—throws down a copious deposit of lithates. The tongue rarely or ever becomes dry, and there is no delirium.

The joints which are affected are the larger joints, viz. the hips, knees, ankles, wrists, elbow, and shoulders. The pain, which is greatly increased by pressure, and attended with redness and swelling, is very severe, especially at night. The inflammation often leaves one joint and attacks another, and it is peculiar in seldom ending in suppuration, ulceration, or gangrene. In most cases the symptoms increase till about the tenth or twelfth day, when the fever begins to subside; the local inflammatiom gradually ceases, and in about a month or five weeks the patient is well, and the joints restored to their natural state. In severe attacks however the duration of the disease may be much longer, and more or less swelling and stiffness may remain for several weeks or even months after the fever has ceased.

At a variable period from the commencement of the attack, inflammation sometimes occurs in the heart or its membranes. Attention is usually directed to this, by pain in the precordial region, or by change in the expression of the patient's face, or an alteration in the character of the pulse, which becomes slower or quicker, or irregular or intermitting; or sometimes, the only symptoms are restlessness and slight cough. On applying the stethoscope to the cardiac region, a bruit or murmur may be heard (pages 366 and 372).

In rare cases the patient may die from the cardiac affection. In general he recovers, but the heart is often so much damaged, that very serious derangements sooner or later occur.

Diagnosis.—The only disease for which it is at all likely rheumatic fever may be mistaken is gout. The distinctions will be given under the latter disease.

Prognosis.—The prognosis is favourable in rheumatic fever, with the reservation that severe cardiac complication *may* be immediately fatal, and it often lays the foundation for disease, which ultimately destroys life.

Pathology.—It is generally supposed that rheumatic fever depends upon a "materies morbi" in the blood, but the nature of this is not ascertained. Whilst some have considered it to be lactic, others have believed it to be lithic acid; and some again assert that it is neither one nor the other, but that "the poison is identical with some natural excretion of the skin."

All the fibrous tissues may be inflamed in rheumatic fever, but those in the neighbourhood of the joints are the most frequently affected. As the result of the inflammation, these parts become thickened and adherent, but as before mentioned, suppuration, ulceration, or gangrene is rarely observed. The frequency of cardiac complication in rheumatic fever is an important point in its pathology. It has been computed that it occurs once in about every six patients suffering from rheumatic fever, and when young females are the subjects of rheumatism few escape it.

Causes.—Cold is often the immediate exciting cause of rheumatic fever, but this will not be operative unless a predisposition exists. Of the nature of such predisposition, or how it is induced, we know nothing. Young persons (excluding children) are more frequently attacked with rheumatism than others.

Treatment.—Various methods of treating rheumatic fever have been recommended and adopted. The chief indications are to eliminate the "materies morbi," to diminish excess of fibrin in the blood, to relieve suffering, and to remove cardiac or other complications.

In very sthenic persons, when the pulse is full and firm, moderate blood-letting at the commencement of the attack may afford some relief, but under other circumstances it would probably do harm. The bowels should be freely acted upon by aperients, with which from fifteen to twenty minims of the wine of colchicum may be combined, and they should be from time to time repeated. In the intervals between their administration, the bicarbonate of soda or potassa may be given every three or four hours, or the acetate or nitrate of potassa in doses of fifteen or twenty grains. To relieve pain opiates should be given at bedtime, and in severe attacks Dover's powder in doses of six or eight grains every six hours throughout the day and night. The diet must be at first restricted, but as the disease makes progress, it should be nutritious without being stimulating.

As regards local applications, relief seems to be obtained from wrapping the affected joints in cotton. The treatment of cardiac complication in rheumatism has been already explained (page 369).

When pain and stiffness of the joints are left, after fever has subsided, benefit is sometimes derived from small doses of colchicum wine; small blisters should be applied, and frictions and embrocations used.

SUB ACUTE RHEUMATISM.—It sometimes happens that one or two joints only are inflamed, or one or more muscles may be affected, the sympathetic fever being slight, or absent. The disease is then said to be *sub-acute.*

Names are sometimes applied to sub-acute rheumatism according to its seat; as *lumbago* when in the muscles of the back, and *pleurodynia* in those of the chest.

Lumbago is a common affection; the muscles of one or of both sides of the back may be affected. The pain is very severe upon the slightest movement, though there may be little when the patient is perfectly quiet, and by this it may be distinguished from nephralgia, as well as by not extending to the testicles or insides of the thighs, and by the absence of nausea and vomiting, and of signs of irritation of the urinary organs.

Pleurodynia is also not uncommon, and must not be mistaken for pleuritis, from which it may readily be distinguished by physical signs.

It is probable that sub-acute rheumatism may occur in muscles and fibrous tissue wherever they may be situated. Thus, it may attack the scalp, the muscles of the eyes, or of the face and neck or abdomen. It is said also to be common in the heart, and in the muscular tissue which is connected with various internal organs.

Treatment.—Colchicum wine is beneficial in this form of rheumatism, and it should be given in combination with cathartics. Dover's powder at bed-time, and repeated in smaller doses at intervals of three or four hours, is also very useful. Fomentations and the warm bath, and afterwards frictions and embrocations give much relief.

CHRONIC RHEUMATISM.

By chronic rheumatism is understood a disease of common occurrence, in which there is pain, without redness, and with little or no swelling in the joints and fibrous textures. It may follow an acute attack, but more frequently comes on slowly, and is connected with some general derangement, as scurvy, syphilis, &c. After the pain has existed for some time, the muscles shrink and become atrophied, and the joints are often rigid and contracted. The duration of chronic rheumatism varies, but it is always difficult to cure, and sometimes resists all treatment: the patient gradually sinks exhausted by pain and want of rest; or having become much debilitated, is carried off by a slight intercurrent affection, as diarrhœa, &c. In other cases it is for a time relieved, but is very apt to recur, and is especially influenced by alternations of temperature. Old are more liable to it than young persons. Many remedies have been tried in the treatment of this troublesome complaint. If it can be connected with any special general derangement, this must of course be removed. Should the pains still continue, frictions, shampooing, and warm baths are to be tried, and such internal remedies given as are indicated on general principles: tonics when there is debility, and alteratives when the secretions are deranged, with of course opiates to relieve pain. Colchicum may also be used, and the various preparations of iodine and iron. Some persons have much faith in large doses of nitrate of potassa, but I confess I have none. Of other remedies occasionally employed may be mentioned turpentine, guaiacum, arsenic, copaiba. A course of mercury has been sometimes successful, but in my hands the relief has been but transient. I know no disease which, in tropical countries at least, is less amenable to treatment, than that now under consideration.

GOUT.—*Podagra.*

Gout is in some respects allied to rheumatism, but differs from it amongst other things, in being generally restricted to the smaller joints.

ACUTE GOUT.—Acute gout is a rare disease amongst the Natives of India, and in the Bombay Presidency is almost confined to European residents and the Parsee community.

Symptoms.—After premonitory symptoms, as gastric derangement, lassitude, pyrexia, restlessness, drowsiness, furred tongue, turbid urine, &c. which may last from a few days to a week or more, the patient is awoke from his sleep, generally soon after midnight, by pain in one of the smaller joints or ball of the great toe. The pain is very severe, and is described as throbbing, burning, tearing, &c. It soon becomes more severe, and the part is swollen, red, and hot, and the superficial veins are turgid; at the same time more or less, and sometimes severe fever sets in. The pain continues without abatement for many hours, or until the middle of the following night, when it and the fever are much lessened, and the patient falls asleep, to awake in the following morning greatly relieved. Towards evening, however, they exacerbate and continue through the night, abating in the early morning; and such exacerbations may recur for several days or a week or more. The fever and their departure is accompanied, and perhaps hastened, by profuse sweating, diarrhœa, or free secretion of urine which throws down a lateritious deposit. The swelling gradually disappears with desquamation of the cuticle.

In some instances the attack is not sudden, but comes on very gradually with irregular flying pains, and as slowly subsides. The premonitory symptoms also vary: they are sometimes very slight and of short duration, at others very severe and distressing, and continuous for weeks or even months. Although individual symptoms are very different in different persons, and in the same person in different attacks, they may in a general way be stated to consist in derangement of the digestion, irregularity in the circulation of the blood, and disturbance of the functions of the nervous system. So soon as the local inflammation is developed, they are for the most part relieved, and when the attack has passed off, the patient often feels in better health than before its occurrence.

In rare instances, by careful management, a person may escape with a single attack of gout; but as a general rule, after a longer or shorter time, there is a recurrence of the disease, at first, in the same, but after repeated attacks, in another joint, or in several joints at the same time. And after each recurrence, the interval between the attacks becomes progressively abridged, and the length of the paroxysm prolonged; but the pain and febrile disturbance are less severe. After the first few attacks, the joint may be restored to its healthy condition, but when they have been frequently repeated, it remains stiff and sometimes contracted, when acute may be said to have terminated in chronic gout—to be presently described. During an attack of gout, it sometimes happens that the external disease subsides, and appears to be set up in an internal organ; and this is most common in weakly persons. The stomach is frequently the seat of the metastasis, but there is scarcely any organ which at all times escapes. When gout attacks the stomach, it either gives rise to symptoms resembling those of acute gastritis, or to violent functional derangement of that organ, which is indicated by severe spasmodic pain, oppression at the precordium, nausea, vomiting, great prostration, and depression of the heart's action.

Next to, or even more frequently than the stomach, the kidneys are affected. At first there may be painful micturition only, from lithic acid in the urine, but nephritis is not uncommon, and is said sometimes to alternate with the external inflammation. When external gout has receded and attacked the brain, the patient becomes drowsy and comatose, or apoplectic. Other parts and organs are sometimes affected, but not with such frequency as to require special notice.

Chronic gout.—Chronic gout, as already mentioned, may be the sequela of an acute attack, but it is not unfrequently a primary disease. The pain is less severe than in the acute form, but it is lingering and wandering. The constitutional affection is often characterised by debility, and there is no fever. Many joints may be involved, and some cases even the larger joints, as the knees and elbows. The swelling is often considerable, but there is neither redness nor heat.

The paroxysms are more frequent than in the acute form and last longer. The joints are stiff and contracted, partly from thickening of the fibrous textures, and partly from the deposit in masses of various sizes of urate of soda *(chalk stone).*

Chalk stones are of all sizes up to that of a walnut. They cause irregularly shaped knotty swellings around the joints, especially those of the fingers and toes. Sometimes the skin over them becomes absorbed, and the chalky matter being in part discharged, troublesome ulcers may form.

Irregular gout.—When anomalous symptoms—neuralgic pains, functional derangements—occur and recur in persons who have had gout, or are predisposed to it, they are often, and probably with justice, related to the gouty diathesis, since they have been known to disappear upon the occurrence of an attack of acute gout, and have been observed with unusual frequency in persons who have previously had gout in some form or other.

Pathology.—There is a general agreement amongst Pathologists, that gout is due to a " materies morbi" in the blood, and that the gouty paroxysm is probably the means by which the peccant matter is eliminated ; but as in rheumatism, the nature of the " materies" has not been definitely ascertained. Many persons believe, that an excess of uric acid is the offending agent, and undoubtedly that acid can very often be detected in the blood, and is largely excreted by the kidneys during a paroxysm of gout. But since uric acid exists in excess in other diseases, and is not always present in gout, some other agent for the production of this disease must be sought for.

Diagnosis and prognosis.—Gout may be distinguished from rheumatism by the small and not the large joints being affected, by the mode of commencement and progress of the attack, and by the absence of the acid sweats. There are, however, cases of chronic gout *(rheumatic gout)*, in which there is much resemblance to rheumatism. Gout is not in general viewed as a disease which is dangerous to life. It must nevertheless not be forgotten, that the gouty diathesis favours the occurrence of diseases which *are* dangerous, and even a paroxysm of gout may be fatal when the disease, leaving external parts, seizes upon some important organ.

Causes.—Gout is hereditary, and this predisposition is probably the most common cause. But the gouty diathesis may be acquired by luxurious habits, too much animal food, and too little bodily exercise; and, on the other hand, when there is much hereditary predisposition, an attack may be warded off by abstemious habits and regular bodily exercise.

Gout is rarely or never seen under the age of puberty, and is more common in men than in women. The exemption of most classes of the people in India from gout has been already referred to.

Treatment. During the paroxysm.—The bowels should be unloaded by a moderately active aperient—as rhubarb and magnesia—which may be preceded by a dose of calomel and blue pill, to increase the secretion of the liver. But the main remedy is colchicum, which should be given in small doses and combined with diuretics or diaphoretics; or with alkalies, when the urine is scanty and loaded with lithates. When pain is very severe, Dover's powder may be given at bed-time.

Local applications do not seem to be of much service. Of course the affected limb should be kept at rest, and relief is sometimes obtained by laying an opiate lotion or poultice upon the inflamed part.

At first the diet should be restricted, but when fever has subsided, moderately nutritious food, which is not stimulating, may be allowed.

If acute gout should attack an internal organ, causing the ordinary symptoms of inflammation, the treatment is similar to that which would be required in inflammation of the organ from other causes, with the reservation that it should be less energetic. But *retrocedent* gout is often accompanied by symptoms of depression, in which case stimulants will be required, and attempts should be made by placing the limb in hot water, to reproduce the disease externally. In gout of the stomach, strong anodynes and antispasmodics are generally necessary.

During the interval.—The treatment in the interval has sole reference to the removal of the cause. Abstinence from all excess in eating and drinking, well regulated exercise, and attention to the state of the secretions, are of great importance. The bowels should be regulated by mild aperients, and should a paroxysm be threatened, small doses of the wine of colchicum may be combined with them.

LEPROSY.—*Elephantiasis Græcorum.*

Leprosy was at one time widely spread over the world, but its prevalence is, at the present time, restricted within narrower limits. It is of common occurrence in various parts of India.

In treating of this loathsome disease, I shall avail myself of the information contained in a very valuable paper upon the subject, published in the Transactions of the Medical and Physical Society, by my colleague Dr. H. V. Carter, whose researches have materially advanced our knowledge of its pathology.

Leprosy may be stated to consist in some general derangement which manifests itself in an altered condition of the skin, followed by wasting and interstitial absorption of the deeper seated parts, which usually commences at the extremities of the toes and fingers.

Two forms of leprosy may be distinguished, viz. the *anæsthetic* and *tubercular*, but it is probable that they are varieties of one morbid state, and are often associated together. Dr. Carter gives prominence to a peculiar eruption upon the skin as probably constituting a third variety.

ANÆSTHETIC LEPROSY.—Anæsthetic leprosy is more common than the other varieties.

Symptoms.—The first symptom usually noticed is impairment of the tactile sense, with "inability to appreciate differences of temperature, and other kinds of irritation" in the face, ears, and extremities. Dr. Carter doubts if the statement often made is correct, that loss of sensation is preceded by hyperesthesia, but I have certainly observed this, and at the present time I am in the habit of occasionally visiting a young Parsee lady, suffering from anæsthetic leprosy, in whom hyperesthesia was a well marked symptom. Uneasy sensations—as pricking, shooting, burning—which sometimes extend upwards to the elbows or knees, are often present in the toes and fingers; and there may be, according to Dr. Carter, spots of local tenderness, as on the side of the neck, above the middle of the wrist or bend of the elbow, or behind and above the inner condyle, behind the inner ankle, or along the inner side of the leg. The patient often complains of aching pains in the limbs. In some cases parts of the face are puffy and tender. The skin of the affected parts is dry and shrivelled, and sometimes of a bronzed appearance, and not unfrequently numerous small bullæ form upon it, especially at the extremities of the toes and fingers. This, the early stage of the disease, may continue for a variable period, but it is sooner or later followed by atrophy or wasting and interstitial absorption of the deeper seated tissues. The hands and feet become distorted and altered in shape; the bullæ above noticed burst and reappear, and sometimes lead to the formation of ulcers—an ulcer on the sole of the foot is often traced to a bullæ—the interstitial absorption, as already mentioned, commences at the ends of the fingers and toes, and phalanx after phalanx is destroyed, the nail however not being removed. In some cases the phalanges are necrosed, and exfoliation with foul unhealthy ulceration takes place. The process of destruction extends even to the carpal or tarsal bones, and sometimes the nasal bones are destroyed.

In the progress of the disease, extensive sloughing ulcers, which often clean and heal, are apt to form.

Along with the local changes just noticed there is more or less cachexia, and indeed a cachectic state often precedes the local manifestation of the disease. In the more advanced stages there is much emaciation; muscular power is impaired; the organs of special sense are blunted; ulcers of all sizes and in various conditions are seen upon the body and limbs; the hairs fall off; irregular accessions of fever (hectic) are common; the appetite is lost, and the patient sinks from exhaustion, or is carried off by diarrhœa or a local inflammation.

Tubercular Leprosy.—Tubercular leprosy commences with thickening, lividity, and loss of sensation in the skin of some part of the face or extremities. The cheeks, and ears, and nose are most often the seats of it, but other parts do not escape. The mucous membrane of the mouth and larynx becomes affected, and the voice is altered; and, as the disease makes progress, the hairs of the face and eyelids drop off. The nose is depressed, and Dr. Carter states, that along the margin of the lips a " corona" may be seen. In a still more advanced stage, the skin of parts of the face, trunk, and extremities is often covered with small tubercles collected into groups, and not unfrequently superficial ulcers are seen upon the ears and extremities—enlargement of the lymphatic glands is not uncommon. The feet and hands are distorted, and the ends of the toes and fingers thickened or clubbed. Fissures and ulcerations occur in the knuckles, at the heels, or on the soles of the feet; and loss of parts takes place by sloughing and necrosis commencing at the joints, rather than by interstitial absorption, but both processes may go on simultaneously. As in the anæsthetic form, the patient at length sinks from exhaustion, or is destroyed by a bowel-affection, which, it is said, may be associated with fatty disease of the kidney.

As already mentioned, the anæsthetic and tubercular forms are often associated together.

Dr. Carter has called special attention to an eruption on the skin, as being present in, and to some extent characteristic of leprosy. For a full description of this, reference is made to Dr. Carter's paper.*

Prevalence of leprosy.—Leprosy most commonly occurs between the ages of fifteen and thirty years. I have, however, seen it in a girl under twelve years of age. It is often fully developed in four or five years, or even sooner, but may continue for twenty or thirty years before it causes death. It is more frequent in males than in females, and is certainly rare amongst the European residents in India, but there are not data sufficient to determine its relative prevalence amongst various classes of the native population. As regards locality, it seems more common amongst the inhabitants of districts bordering upon the sea, but it occasionally occurs inland.

Pathology.—The pathology of leprosy has been but little studied. The most original and recent observations upon this subject are by Dr. Carter, from whose excellent paper the following account is compiled. The brain and its membranes, and the spinal cord and its membranes, are not diseased, nor is there any special morbid condition of the heart and arterial system, lungs, liver, spleen, or intestinal canal. The kidneys are not unfrequently affected with fatty degeneration, but the relation of such disease to leprosy, and its influence in hastening the fatal termination, has not been determined. The small muscles of the hands and feet are atrophied, and sometimes converted into fibrous tissue. The chief morbid appearances are however in the nerves, which are distributed to the face and extremities, and perhaps also in others distributed to the trunk. Dr. Carter thus describes the appearance of the diseased nerve:—

> "The diseased nerve is swollen, but not abruptly so, and of a reddish grey or semi-translucent aspect, rounded, and firm. Its coat of connective tissue is little changed, the funiculi alone being the seat of disease. These, enlarged and grey in colour, impart a streaked or marbled appearance, and when the nerve is cut across, they start up separate and firm, almost as if previously under some degree of tension; in the healthy nerve they rather droop. On further examination, the clusters of nerve tubules are found to have mostly disappeared, their place being taken by a clear gelatine like deposit, which has separated and compressed them."

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* Transactions of the Medical and Physical Society of Bombay, No. VIII., New Series, page 5.

These appearances are not observed in the whole course of the nerve, but only at certain selected spots, above which the trunk of the nerve may be healthy, whilst below them it is atrophied.*

As regards the nature of the disease of the nerves, Dr. Carter believes it to be "one of fibrous conversion or degeneration, commencing either in the envelope or limiting membrane of the nerve tubules (which is possible), or immediately on its exterior, with the effusion of organizable material."

The pacinian corpuscules are sometimes but not always enlarged, and the papillæ of the skin are diminished in size or wanting. In tubercular leprosy, a deposit, similar to that in the nerves, is found in the skin and mucous membrane of the mouth. The bones of the hands and feet are destroyed either by interstitial absorption or by necrosis.

Although Dr. Carter failed in finding evidences of disease in the nervous centres, yet in other countries where leprosy prevails (Norway and Sweden) albuminous exudation has been noticed on the arachnoid of the posterior surface of the spinal cord. The gray substance of portions of the cord has also been observed to have lost in part its gray colour, to have become pale and hard. Somewhat similar appearances have been found in the brain at the origin of the cranial nerves, in cases where the face was affected.

Of the pathology of leprosy, it must be confessed that little is known. It is stated by Dr. Morehead to be "a striking instance of cachexia causing structural change of organs, by exudation deposit from the blood, with subsequent degeneration of the deposit, and more or less of the adjacent textures." That the changes in the nutrition of the affected parts is in a great measure due to altered innervation, is almost a necessary inference from Dr. Carter's researches.

Causes.—The causes of leprosy are unknown, but there is reason to believe that it is sometimes hereditary. There is no proof of its being contagious.

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* For the appearances which the diseased portions of the nerves present under the microscope, the student is referred to Dr. Carter's paper, page 64.

Prognosis.—The prognosis, as regards cure, is unfavourable, but the period when death may be expected varies much in different cases.

Treatment.—There is no specific remedy for leprosy, and it is questionable if any remedies are of use, except of those which, on general pirnciples, are calculated to improve the general health and remove cachexia.

ELEPHANTIASIS. *Bucnemia.*

Elephantiasis bears no resemblance to leprosy, although the latter disease has been sometimes called *elephantiasis græcorum,* whilst the former is by some named *elephantiasis arabum.* It shows itself by slowly increasing swelling and thickening in various parts of the body, but most frequently in the scrotum and extremities. It is a common disease in many parts of India bordering on the sea coast, as in Bombay, the Malabar coast, and lower Provinces of Bengal.

Symptoms.—Elephantiasis often commences with inflammation and swelling of the affected part, accompanied by febrile disturbance. The inflammation sometimes extends to the nearest lymphatic glands, and even along the veins. In the course of a few days, it and the fever subside, but the part remains swollen. At a variable period it returns, and after each attack there is more or less permanent increase of the swelling; and the attacks recur again and again until the part sometimes assumes enormous proportions: the scrotum has been known to weigh 120 pounds or more. My colleague Dr. Ballingall lately removed one the weight of which was 110 pounds.

In some instances the commencement and progress of the disease is slow and uninterrupted, there being no inflammatory attacks and no fever. Occasionally the swelling goes on increasing up to a certain point, and then becomes stationary, and sometimes a milk-like fluid exudes from the diseased mass, and apparently retards its progress. After the disease is fairly established, the skin is rough and tubercular, and sometimes fissured or ulcerated. But, as a general rule, suppuration, ulceration, and gangrene do not occur, unless inflammation has been caused by irritating applications. When there is neither fever nor ulceration, the general health does not materially suffer, though, when the tumor is of large size, the patient is anæmic looking. But the repeated attacks of fever and pain in many cases reduce the strength and cause more or less cachexia. Elephantiasis does not tend to death, except in so far as the attendant derangement may predispose to the causes of other diseases.

Pathology.—Elephantiasis is generally viewed as a "blood disease," the local thickening being due to exudation, which undergoes a low form of organization. The epidermis and cutis and subcutaneous areolar tissue are thickened, and in the areolæ of the latter there is a semifluid gelatinous matter, and in large tumors there are considerable quantities of serous fluid. According to Dr. Allan Webb, the muscles generally are pale, thin, and softened, and in a state of fatty degeneration.

There has been some discussion as to the relation which the febrile disturbance bears to the local disease. By some the fever is thought to precede the local inflammation, and in a measure to cause it; by others, myself included, the local inflammation is believed to be antecedent, and the fever to be nothing more than the constitutional disturbance, which even slight inflammation, almost invariably occasions in the natives of India. The question is of some importance, for if the view first stated should be correct, it might be possible, by checking the fever, to cure the local affection. Without setting up my own opinion against that of others, who have had equal or better opportunities of investigating this disease, I will merely observe that, in the cases which have fallen under my notice, the fever seemed to me to be sympathetic of the local disease.

Causes.—The prevalence of elephantiasis in tropical climates in certain localities upon the sea-board, would seem to show that heat and moisture are concerned in producing it. But in other localities, where heat and moisture are equally abundant, the disease is unknown. The truth is, we are ignorant of its cause or causes.

Treatment.—Those who consider fever as the antecedent affection, believe it to be of much importance to prevent the occurrence of paroxysms by the use of quinine. For my own part I should have little confidence in this treatment, though quite willing to adopt it in the absence of anything better. When inflammation and fever are present, aperient and diaphoretics should be given ; the part should be kept at rest, and evaporating lotions used. By treatment of this kind at the very commencement of the attack, some believe the disease may be cured, but I have never seen an instance of this. There is reason to suppose that change of climate has the effect of retarding the progress of elephantiasis, but whether a cure is ever thereby effected, is I think doubtful.

Removal by surgical operation is the only certain mode of curing elephantiasis.

SCORBUTUS.—*Scurvy.*

Scurvy is an altered state of the blood and of nutrition, caused by insufficient food, or food deficient in certain alimentary constituents. It has long been known and described, and was at one time the source of great mortality amongst sailors and soldiers. Of late years, owing to the adoption of preventive measures, its prevalence has greatly diminished. Nevertheless, it is by no means of unfrequent occurrence amongst the poorer classes of the people in various parts of India.

Symptoms.—The prominent symptoms of scurvy are a swollen or spongy state of the gums, petechial spots on the skin, hard swelling in the situation of the ham-string muscles, and more or less general anæmia. The first symptom is usually a changed appearance of the face : it becomes pallid, and dingy, and puffed. This is soon followed by depression of the mental and physical powers : the mind cannot be applied to anything requiring much thought, and muscular exertion is impossible. At an early period of the disease the gums are found to be swollen and livid, and to bleed upon pressure, the lips and mucous membrane of the mouth pale and exsanguined, and the breath fetid. The pulse, though often full, is soft and compressible and sometimes jerking ; the skin is dry and harsh, and the tongue furred. As the disease makes progress, these symptoms are aggravated, and others set in of a more serious character : the breathing is hurried and oppressed ; palpitation of the heart occurs on the slightest exertion, and there may even be attacks of giddiness or even of syncope. The gums become more swollen and spongy, and ulcerate or slough ; the teeth become loose and drop out, and the alveoli may exfoliate. The breath is horribly offensive. Petechial spots and large livid patches are seen upon the skin, and hæmorrhages from the nose, mouth, intestines, and bladder are not uncommon. The lower extremities are swollen and painful, especially in the situation of the ham-string muscles. The feet become œdematous, and there is much general debility—in some cases so great, that persons have been known to die upon making the slightest exertion. A wound or abrasure, should such exist, assumes a peculiar and unhealthy appearance: the surface is flabby, soft, and bleeding; the blood coagulates, and forms a crust, underneath which the ulcerative process often rapidly extends. The cicatrices of wounds or ulcers are often absorbed, and fractures of bones which have united have become loose from absorption of the uniting medium.

Throughout the course of the disease there is a predisposition to intercurrent inflammations, by which the patient may be carried off; or he may die suddenly from syncope, or slowly from gradual exhaustion. When, as not unfrequently happens, there is a tendency to dropsy, death is often caused by pulmonary œdema. Fever is seldom present, and the digestive function is not in general much impaired. There is usually less emaciation than might be expected, and the intellect is sound.

Pathology.—In fatal cases, blood is often found extravasated in various situations, as in the skin, the mucous membranes, the subcutaneous and submucous tissue, around the ham-string, and some other muscles, or into their substance; between the periosteum and the surface of bones, and in the great serous sacs. Serous effusions are also common, and not rarely in the parenchyma of the lungs. The blood is altered: it does not readily coagulate, and the serum is reddened by the colouring matter which has escaped from the corpuscules. The red corpuscules are in deficient proportion, and the fibrin slightly increased. It has been thought that the blood of scorbutic patients is deficient in potash, and that upon the deficiency of this constituent, the pathology of scurvy mainly rests. But further investigation is necessary before we can admit an explanation to which very strong objections might be opposed.

Causes.—There has been much discussion as to the cause of scurvy. The general belief is, that it arises from the want of fresh succulent fruits and vegetables; at the same time it is certain, that impure air, fatigue, and indeed everything which produces debility, favour its occurrence. The circumstances which lead to scurvy are most operative on board ships during long voyages, and hence the disease often affects sailors; but it is not uncommon amongst soldiers during campaigns, prisoners in jails, and amongst the poorer classes of the people in large towns. In India it is common amongst pilgrims to various shrines, who often subsist by begging during their pilgrimage.

Treatment.—Scurvy can of course be prevented by a proper regulation of the diet. On board-ships where fresh vegetables are not procurable, their place may to some extent be supplied by lemon juice, an ounce of which with a little sugar may be given to each sailor daily. Much also depends upon the food being sufficiently nutrient, and upon attention being paid to cleanliness and ventilation.

When scurvy has occurred, the main part of the treatment consists in the administration of those articles of food which are known to have antiscorbutic properties. The acid fruits—as limes, oranges, pumplenose, pomegranates; vegetables—as potatoes, cabbage, turnips, radishes, &c., are amongst the best. Milk has also antiscorbutic properties. It is said that raw vegetables are more antiscorbutic than when they are cooked. When there is much anæmia fermented liquors are useful.

As regards medicines in this disease, few are necessary when a suitable diet is procurable; but in the absence of this, citric acid may be administered, or the salts of potash, as recommended by Dr. Garrod. The vegetable tonics are sometimes useful. When there is much pain opium is required.

For the painful state of the gums and the ulcers in the mouth, slightly astringent gargles may be used, and to remove fetor Condy's solution or a solution of creosote may be applied to the gums.

In severe cases, the patient should be warned against making any exertion, however slight, lest death should occur by syncope.

PURPURA HÆMORRHAGICA.

Purpura consists of dark red or purple spots on the skin, in many instances accompanied by hæmorrhages from the several mucous surfaces.

Symptoms.—The appearance of the eruption is often preceded by feelings of languor and pains of the limbs, with loss of appetite, and sometimes faintness and general debility. Similar spots are occasionally seen on the surface of mucous membranes, and have even been found upon other membranes and in the substance of various organs. Coincident with or after their appearance, hæmorrhage takes place from the nostrils, mouth, and ear; from the stomach and intestines, from the urinary organs, and indeed in severe cases from every mucous surface; and occasionally blood is poured out into the parenchyma of organs. Constitutional disturbance may be altogether absent, with the exception of such as loss of blood may occasion; but at times there are febrile symptoms, and the pulse is frequent and hard. In some cases there is evidence of derangement of the intestinal and hepatic function. The duration of purpura varies from a few days to several months or years. I have at the present time a child under my observation, who has been affected with purpura hæmorrhagica for two years.

When there is no hæmorrhage, purpura is always recovered from, and even the hæmorrhagic variety is seldom fatal. Every now and then, however, the hæmorrhage is so profuse, as to cause death by anæmia; or extravasation of blood into the substance of an organ may be so great, as to suspend its function.

Causes.—The causes of purpura are little understood. It occurs most frequently in weakly persons, but those who are strong and robust are by no means exempt. It is more common in females than in males.

Diagnosis.—The only disease which resembles purpura is scurvy, but from this it may be distinguished by the absence of swelling of the gums, and of stiffness and swelling of the extremities, and by the brighter and more florid colour of the eruption. These diseases also differ from one another in their causes: whilst scurvy is caused by the want of fresh vegetables, purpura occurs when they are abundant.

Treatment.—When there is evidence of weakness and debility, all possible means should be adopted to improve the general health by nutritious diet, tonics, and stimulants. The secretions should be carefully attended to, and constipation removed by mild laxatives. In those somewhat rare cases, in which there is a sthenic state of the system and febrile reaction, with signs of congestion of an internal organ, general blood-letting is recommended, and mercurial and other purgatives. In cases which are neither very sthenic nor very asthenic, a middle plan of treatment will be required. When the hæmorrhage is very considerable, astringents, as acetate of lead, gallic and tannic acid, turpentine, &c. are indicated. Should the hæmorrhage be chiefly from some one part, as the nose or vagina, local means of suppressing it may be had recourse to.

BERI-BERI.

When individuals who are scorbutic are exposed to cold and alternations of temperature, they are not unfrequently attacked with general dropsy. It has been customary to designate the disease now referred to by the term Beri-beri, but, as suggested by Dr. Morehead, no special name for this affection seems to be required.

Symptoms.—The symptoms may occur suddenly, or set in gradually with weakness and stiffness of the lower extremities. When fully developed, they are dropsical swellings, more or less general, dyspnœa, and oppression at the epigastrium, weakness and stiffness of the lower extremities, vomiting, sometimes of blood. The urine is scanty and high coloured; the pulse badly developed and often intermitting. As the disease makes progress, the stiffness and weakness of the lower limbs are aggravated, until the patient is unable to walk; the dropsical swellings increase, the pulse becomes weak and fluttering; there is much palpitation of the heart, and its sounds are distant and muffled. At length the palpitations become almost constant, the pulse is very feeble or imperceptible, and the patient sinks in a period varying from a few days to several weeks.

Pathology.—In fatal cases, serous effusions are found in various situations, as in the sacs of the pleura, peritoneum, and pericardium, the parenchyma of the lungs, &c. No organic disease can in general be found, but the liver is often enlarged from congestion.

As regards the pathology of Beri-beri, Dr. Morehead says:—

> "A state of the system in which the blood is sufficient in quantity, and its water in undue proportion, is the predisposing condition; and cold or wet is the exciting cause; no doubt in some instances the effusion is further favoured by co-existing heart, lung, or kidney disease. But how does this state of the blood arise? It is present in the scorbutic diathesis, and this constitutional condition may exist to some extent before the phenomena characteristic of scurvy appear. Let it be further remembered, that impaired irritability of muscular fibre, that of the heart included, is among the early derangements of the scorbutic state. We have thus as predisposing conditions of dropsy, not only watery blood sufficient in quantity, but also propelled by a feeble acting heart. Let us suppose an individual in this state to have the surface of the body exposed to an atmosphere cold and damp, or to the chilling influence of piercing winds, and we have a combination of circumstances surely adequate to predispose to and excite general dropsy—the more certainly if the skin has been previously actively perspiring, and the kidneys, from congestion or structural defect, do not readily assume a compensating action."

Treatment.—The treatment of Beri-beri is similar to that of general dropsy, with the addition of antiscorbutic remedies, and in most cases stimulants. In acute cases, in sthenic persons, the treatment applicable to the acute form of Bright's disease (page 278) may be adopted with advantage, but such cases are rare. For the most part, the treatment must be rather supporting than depleting. A combination of diuretics and tonics would seem to be indicated in many cases; but should these fail, and the dropsy increase, purgatives may be cautiously tried. In some cases secretion from the skin may be excited by the vapour or hot air bath.

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ERRATA.

Page	Line	For	Read
36	23	fluid	florid.
62	2	induced	evidenced.
94	last line. .	effect	effort.
127	31	square	cubic.
189	18	tanic	tannic.
260	24	regiis	regius.
298	passim ..	broncophony	bronchophony.
299	passim ..	rhoncus	rhonchus.

386 } 7 after & not before } before and not after.

cters III & IV do not come up to my idea of what
might and ought to be. They contain the practi
ical of the study of medicine on their just relat
morbid states and their causes & to each
ther (i.e. Hygienics and Therapeutics) the true
aracter of progress of the medical profession is
pendent – they are and ever have been
an unsatisfactory state and it should in
main object of every systematic writer on
edicine to endeavour to place them in the
ght groove – The present tone – as in the Arm
edical Dept and in civil life also – is
exclusively to consider Hygienics and
undervalue Therapeutics – while Therapeutics
puzzled & perplexed by false & partial systems –
Hygienics is not to be placed in its right
sition by undervaluing Therapeutics; nor
herapeutics by undervaluing Hygienics –
They have both their appropriate place and
mportance

In respect to the prevention of disea
he general principles should be stated
ematically applied in a systematic man
in reference to the several classes of pre-
disposing and exciting causes –
Mental states in a large acceptation of th
term should have its methodical place
both in the causes & Hygienics –

In the chapter on Hygienics reference
has been well made to the habits of the
natives of India – I do not suggest a detai
that would be incompatible with the

ope of the work. but merely a clear commu tting of the principles in relation to Etiology reference to where the details are other ound and an allusion to those of them that enter into the Course of Jurisprudenc I think that no opportunity should be los of keeping before students distinct views of relations of the several branches of medica study to each other and inculcating tha their convergence into the prevention & cure of disease is the practical aim to which all others must be subservient

Section on Therapeutics good as Remarks on Bleeding - Remarks on Mercury seem agai favor of it than is intended, do not shew clearly the modicum of use & do not proclaim enough the maximum of abuse -

(1) After a few general remarks on the division of Therapeutics into Regimen and Remedies - on the mode action & classification of Remedie in after arrangement follow very much that of Section I to which Therapeutics bears the same practical relation that Hygienics does to Section II

,2, That first regimen i.e. the adjustment the vital stimuli - drawing certainly as respects tonic Regimen the close relatio of this branch of Therapeutics to that portion of Hygienics which has to deal with vital stimuli - shew that this adjustment of regimen is often sufficie without remedies for the cure of disea & that when not it should always be Combined with the

ion the first (but hitherto neglected) importan
t mental states - Then make a calm
philosophic reference to Homoeopathy &
such systems - Their successors, having defin
n régime and the management of the
mind there a passing allusion to the
placebo principle - its Ethics -

3) Then treating of water baths & also in
connection with tonic régime - Dispos
of Hydropathy by showing that it is mere
methods of applying well understood
principles - would not withhold credi
from methods practically useful whil
point to the danger of indiscriminate use

This might be done in short space -
The professor must learn to look calm
n these such things and treat them in a
hilosophic & an absolutely uncontrovers
pirit, if it cares for the character of bein
cientific and aims at steady progress -
f without at all touching on the provin
Materia Medica there might be a spec
ew not excessive and confusing ment
f articles of the Materia Medica as
erving to bring the Course of Materia
ica view in the students mind, into
ts relation to the principles & practice
f medicine —— End

Author Peel- John 69762 M Pr P

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